

JOURNAL *of* FARM ECONOMICS

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INTERNATIONAL PRICE CONTROL THROUGH BUFFER STOCKS*

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Office of Foreign Agricultural Relations

IN THE quest for greater economic stability, a proposal has been developed for price-stabilizing intervention in the world markets by an international buffer-stock agency.¹ This agency would buy and sell storable raw products that are prominent in international trade and would hold stockpiles of them for the purpose of reducing the short-term fluctuations in their prices.²

* Responsibility for the opinions stated in this paper rests upon the author only. He desires, however, to express his gratitude to economists in the Department of Agriculture and to many others who in discussions have contributed to the forming of opinions here presented. In particular he feels indebted to Robert B. Schwenger, who has amply given from his intimate knowledge of raw-product economies. Special thanks are due also to Leslie A. Wheeler, Eric Englund, and George B. L. Arner of the Office of Foreign Agricultural Relations; Normal J. Wall, Oscar C. Stine, Donald C. Horton, and L. D. Howell of the Bureau of Agricultural Economics; Frederick V. Waugh and Herman M. Southworth of the Marketing and Production Administration; Robert M. Carr of the Department of State; Howard S. Ellis of the Board of Governors of the Federal Reserve System; Carl Pribram of the Tariff Commission; and P. Lamartine Yates of the Food and Agriculture Organization. Lord Keynes also has been good enough to comment on this article.

¹ Material relevant to the development of this proposal has been published by the International Labour Office in "Intergovernmental Commodity Control Agreements," Montreal, 1943.

² In this comprehensive form, the proposal goes considerably beyond earlier attempts to operate international buffer stocks only for one commodity (an example being tin) or to reduce price fluctuations through national stockpiling, such as was done in the United States under the auspices of the Federal Farm Board and the Commodity Credit Corporation.

Benjamin Graham (*Storage and Stability*, 1937; and *World Commodities and World Currency*, 1944) submitted plans that would go much further than merely preventing short-term price fluctuations; he would monetize, nationally or internationally, a composite unit of raw products. This idea is being advocated also by Frank D. Graham (e.g. in his *Social Goals and Economic Institutions*, 1942; and *Fundamentals of International Monetary Policy*, 1944) and by Frederick A. Hayek ("A Commodity Reserve Currency," *The Economic Journal*, June-September 1943). An appraisal of these proposals would require the discussion of their monetary implications and thus go beyond the scope of this paper.

The proposal began to find world-wide attention when, in 1937, the League of Nations' Committee for the Study of Raw Materials published a buffer-stock scheme developed by two of its members and commended it "for most serious consideration."³ First, the proposal was received with considerable doubt as to its feasibility; even that Committee declared itself unable "to express a decided opinion whether it will be possible to surmount the various difficulties which would be encountered in framing such a scheme." Gradually the buffer-stocks proposal has found many important advocates. Nevertheless, sharp controversies persist regarding possible achievements.

Leaving aside those who oppose any form of intervention by governments or by intergovernmental organization, we can, by and large, group the varying opinions on the proposal into three categories: (1) those who question its feasibility; (2) those who want to make buffer stocks the principal or even the exclusive instrument for balancing production and consumption of raw products and contend that this could be done in a manner satisfactory to both producers and consumers; and (3) those who, though favoring buffer-stock operations as a means to mitigate short-term fluctuations in raw-product prices, claim that, at least in regard to the so-called surplus products, such operations would not suffice to ward off wide-spread distress among producers in exporting countries.

Herbert Feis may be quoted as representative of the first group. He believed that buffer stocks would fail because "the controlling authority would almost inevitably find itself subject to the dictation of the producing interests in the various countries."⁴ This point of view seems to be more pessimistic than warranted. It is true that the disposal of stocks, accumulated by governments of exporting countries in pursuance of national price-support programs, has frequently encountered opposition by producer groups; but governments have sold such stocks in spite of this opposition. An international buffer-stock agency, with importing as well as exporting countries as participants, would be even less exposed to producer opposition than national governments. Those countries that are substantial importers would resist efforts to influence buying

³ League of Nations, Official No.: A.27.1937.II.B., Geneva, 1937, p. 20.

⁴ "Raw Material Prices and Controls," in *Proceedings of the Academy of Political Science*, January 1945, p. 43.

and selling operations one-sidedly in the producer's interests. In taking such a position, these countries would probably not encounter strong resistance from their own producers because protection has, in most of these countries, bestowed upon domestic producers a substantial degree of independence from the world price. The exporting countries, on the other hand, could counter such importing-country resistance only by forcing the international buffer-stock agency into liquidation. In doing this they would make the disposal of accumulated stocks an acute problem, and would provoke a crisis in the world markets of the respective commodities. Therefore, this writer considers it improbable that a buffer-stock agency formed by governments of both importing and exporting countries would be "subject to the dictation of the producing interests," as Dr. Feis has suggested. If this objection to the feasibility of buffer stocks is invalid, the controversy as to the extent to which such stocks could contribute to an improvement in economic conditions attains, however, increased importance.

Turning to this controversy, it may be noted that the British Delegation to the Hot Springs Conference on Food and Agriculture and, more recently, the League of Nations' Delegation on Economic Depression (in the following referred to as British Delegation and League Delegation respectively) were prominent among those who have expressed far-reaching expectations as to the results obtainable through buffer-stock operations. The British Delegation⁶ suggested that buffer-stock operations should be aimed at "combining a short-period stabilization of prices with a long-period price policy, which balances supply and demand and allows a steady rate of expansion to the most efficient producers." It expressed the opinion that "it should be possible to achieve this aim through variations in the prices at which the authority controlling the buffer stock is a buyer and a seller," and that such a form of management would be "preferable to one based on export or production quotas." The League Delegation⁶ went even further and claimed that buffer stocks are "likely to prove most effective" as a measure "for stabilizing the money income of producers of primary goods."⁷

⁶ See statement published in the *New York Times*, May 24, 1943.

⁶ Report on "Economic Stability in the Post-war World," *League of Nations*, Official No.: C.I.M.1945.II.A., Geneva, 1945, p. 315.

⁷ It may be noted that the British Delegation had promised producers only that buffer stocks would assure them ready markets, but it had made no promise regarding the stabilization of their money income.

A more cautious attitude, though also favoring the use of buffer stocks as a short-term stabilization measure, was represented at Hot Springs by those delegations, including the delegation of the United States, that believed that buffer-stock operations "without the backing of control arrangements would not prevent the disastrous situations to which agricultural countries have been subjected periodically."⁸ Of the economists who supported such an intermediate position, P. Lamartine Yates and Edward S. Mason may be mentioned. Mr. Yates, in his excellent book on *Commodity Control*⁹ which appeared shortly after that Conference, came to the conclusion that "neither buffer stock nor quota schemes are sufficiently flawless to enlist our unqualified support as the sole method of commodity control. . . . We want the cushion which buffer stocks provide against short-period ups and downs in supply or in demand. At the same time, we want to be able, if need be, to reduce output without beggaring thousands of individual producers; and this seems a job for which quotas are well suited." Dr. Mason¹⁰ stated that "a buffer-stock scheme might be successfully operated as an adjunct to an international commodity agreement but not independently of it. In the absence of effective output controls, an offer to buy on a large scale, even at a price below the market, would be likely to lead to an increased output and thus augment the surplus which the buffer-stock control was attempting to eliminate."

If this conflict of opinion between the optimistic and the cautious advocates of buffer stocks is to be resolved, more clarification is needed (1) in regard to the possible effects of buffer stocks on economic conditions in general and on such specific factors as price levels, price relationships, producer income, consumer buying power, marketing costs, production trends, and government intervention; and (2) in regard to the methods that could effectively be used in the conduct of buffer-stock operations.

With the intention to contribute to this end, Part I of this article discusses some general economic implications of international price control through buffer stocks. Part II discusses organizational and operational problems. Those less interested in theoretical problems might turn to the conclusions of Part I and then to Part II.

⁸ Final Act and Section Reports of the Conference, p. 60. Unable to reconcile conflicting points of view, each of which found strong supporters, Section III of this Conference could report only disagreement.

⁹ London 1943, p. 232.

¹⁰ "The Future of Commodity Agreements," in *Food for the World*, ed. by T. W. Schultz, 1945, p. 244.

I. *Economic Implications of International
Price Control through Buffer Stocks*

Even in the absence of any intervention, market prices are determined by a highly intricate interplay between a great number and variety of factors. An effort to control the short-term functioning of this interplay in regard to a selected group of commodities would tend to have a multitude of repercussions, some of them desirable but others less desirable or even undesirable. These repercussions become still more involved if such control has to be undertaken, as it would have to be, in the presence of other forms of intervention.

1. *Effect on cyclical price fluctuations.* Through its secondary repercussions, stabilization of the prices of raw products, if accomplished through buffer-stock operations, would tend to reduce the fluctuations of the prices also of semi-manufactured and manufactured products and of services; thus it would exert a mitigating influence on the general price level, and further, in consequence on the business cycle. This effect would be achieved without permanent binding of funds because, under effective management, the funds to be invested through buying raw products during a downswing would be recovered through selling these products during a subsequent upswing. Moreover, the area of attack would not be one specific country but the world market; international buffer stocks would, therefore, be an improvement over those national anti-depression policies (such as import restrictions and export subsidies) that have tried to improve the domestic situation through exporting depression.

On the other hand, even under conditions of world-wide free competition, the anti-cyclical effect of buffer stocks would be limited by the limited importance of raw products in the economy; it would vary from country to country in accordance with the varying importance of raw products in the national economy; and, in the course of economic development, it would tend to decline with the increase in the importance of manufacturing and services.

Furthermore, it must not be overlooked that the world market, whose prices would be stabilized by international buffer-stock operations, has become separated from the markets in the various countries through tariffs, industrial cartelization, widespread governmental support for agricultural prices and incomes, and various other barriers to trade. In many instances, the actual effect of international price control on the national prices would, therefore, be

far less than it could be under conditions of world-wide unrestricted competition.¹¹ Should current efforts succeed in liberalizing international trade, however, the potential effectiveness of buffer stocks as an anti-cyclical device would also be increased.¹²

2. *Effect on price relationships.* There is certainly a particular need for price stabilization in the raw-product markets because the prices in these markets tend to fluctuate more violently during the business cycle than do those of manufactures and services. During a boom they tend to increase not only absolutely but also relatively to other prices and thus cause manufacturing and living costs to increase and raw-product production to be overexpanded. During a depression they tend to drop not only absolutely but also relatively to others and thus cause widespread distress among raw-product producers, while easing the economic position of processors and somewhat reducing the living costs of consumers (thus partly offsetting the effects of the decline in consumer income).

Index numbers of U. S. wholesale prices (1926=100)

	1913	1917	1921	1925	1929	1933	1937	1940
Raw material	68.8	122.6	88.3	106.7	97.5	56.5	84.8	71.9
Finished products	69.4	109.2	103.3	100.6	94.5	70.5	87.2	81.6

But by preventing or greatly reducing the short-term fluctuations in the prices of selected raw products while permitting other prices to fluctuate in the course of the business cycle, buffer stocks would not only eliminate such changes in price relationships, but they would replace them by changes in the opposite direction. For if the short-term fluctuations of the prices of certain raw products were eliminated, or nearly eliminated, these prices would decline relative to the prices of other products during the upswing and would increase relative to them during the downswing.

As a result of such a reversal of usual cyclical price relationships, the producers of products controlled by buffer stocks would be overcompensated for the impacts of depressions but would see their real income reduced during a boom. The processors on the other hand (and to a minor extent the consumers), would make windfall profits during a boom, but would see their difficulties increased during a depression.

¹¹ See Robert B. Schwenger, "World Agricultural Policies and the Expansion of Trade," *This JOURNAL*, February 1945, pp. 67 ff.

¹² As to the question of the reaction of intervening governments to buffer stocks, see below p. 430.

The advantages resulting from these relative price changes would be willingly accepted or even taken for granted, but the disadvantages would meet with resentment. During a boom, producers would complain that the buffer-stock operations kept the prices of their products artificially below free-market prices. During a depression, processors would complain that the buffer-stock operations forced them to restrict production and employment. Pressed by shrinking markets and declining prices of their own products, they would probably not be willing to accept the argument that, by paying more for raw products, they would help to maintain the income of the producers of these products and thus the markets for manufactured goods among these producers.

From the viewpoint of a contra-cyclical policy, the reduction of real producer income during a boom and the increase in processor difficulties during a depression would have to be counted as partial offsets to the favorable effect of buffer stocks on cyclical disturbances.

Beyond this, attention needs to be given to the effect that the temporary changes in price relationships between the products controlled by buffer stocks and other products would have on comparative advantage, and thus on the use of such resources as could alternatively be used for the production of either of these two classes of products.

Even in the absence of buffer-stock operations, the production of certain agricultural staples has sometimes been expanded in spite of a decline in the prices of these staples, especially when the prices of other products competing for the same resources declined relatively more. Vice versa, such production has been contracted in spite of an increase in their prices when the prices of products competing for the same resources increased relatively more. An example is offered by cotton. In spite of extremely low cotton prices during the crop year 1932, the cotton acreage planted in the United States was expanded by more than 10 percent in 1933. On the other hand, the cotton acreage was reduced in 1919 in spite of an increase in the cotton price during the preceding crop year.¹³

If a buffer-stock agency should control short-run price fluctuations of cotton and other important international staples, more and

¹³ See L. D. Howell, *Cotton-Price Relationships and Outlets for American Cotton*, U. S. Department of Agriculture Technical Bulletin No. 755, January 1941, pp. 15-16.

stronger shifts to the controlled products would probably occur during depressions and more and stronger shifts to products not so controlled would take place during booms.

During a depression, national price supports for products not controlled by international buffer stocks (such as perishables and products sold only in domestic markets) would have to be resorted to if government should desire to prevent production shifts from products not controlled to products controlled by buffer stocks. Yet most governments would probably prefer to ease their depression problems by permitting the output of the internationally controlled products to expand and unloading the resulting surpluses on the buffer-stock agency. During a boom, intervention by national governments would be needed to prevent overexpansion in the output of products not internationally controlled.

The repercussions of the stabilization of certain raw-product prices only would be reduced if a considerable margin were maintained between the buying and the selling prices of the buffer-stock agency. This is being advocated by some proponents of the proposal, but it is not a satisfactory solution because the stabilizing effect of buffer stocks would also be greatly reduced by the maintenance of a large "non-intervention" margin.¹⁴

From the short-run viewpoint, this problem could be solved by stabilizing not the absolute prices of raw products but their relationship to the general price level. In the long run, however, the maintenance of fixed price relationships would violate the fundamental principle of the buffer-stock proposal, namely, to foster long-run adjustment by means of the price mechanism; and, in the face of a tendency of the long-term price relationships to change, it would result in a failure of price stabilization by buffer stocks. Yet the extent of undesirable secondary repercussion of selective raw-product-price stabilization might be substantially reduced or even avoided if the level of the intervention prices were readjusted on the basis of some objective criterion that would indicate strains in price relationships.¹⁵

¹⁴ See below p. 423.

¹⁵ A tentative suggestion for such a flexible price policy of the buffer-stock agency is outlined on pp. 441.

As to the detrimental effects of rigid price fixing, the following is quoted from a letter by Lord Keynes to this writer, dated October 8, 1945: "I would agree with you that such a price policy would be a foolish one. The base price should in my opinion change from time to time not only in accordance with the index number of general prices but also according to whether the base price was proving excessively discouraging or excessively encouraging to the optimum level of output."

3. *Effect under conditions of varying crop yields.* In uncontrolled markets agricultural prices fluctuate not only in response to the variations in demand that are characteristic of the business cycle but also in response to the variations in crop yields that are caused largely by the vagaries of nature.

The effect of these two kinds of price fluctuations on producer income differs considerably. Price fluctuations in response to cyclical variations in demand tend to have an unstabilizing effect on farm income, and price fluctuations in response to nature-caused variations in crop yields tend to have a stabilizing effect on such income. Therefore, keeping farm prices stable, by buffer stocks or in some other way, would tend to reduce the fluctuations in producer income in the case of cyclical variations in demand, but to increase these fluctuations in the case of nature-caused variations in crop yields. Similarly as in the case of cyclical price fluctuations, feeder and processor interests (and ultimately consumer interests) tend to run contrary to those of the raw-product producers. Feeders in particular would profit considerably by the maintenance, through stockpiling, of an ample supply of feedstuffs during years of short crops; and the greater supply stability thus obtained would probably outweigh for them the disadvantage of having to pay higher than free-market prices in years of large crops.¹⁶

The influence of variations in crop yields on world market prices is often offset by the influence of other factors such as changes in stocks, changes in demand, and changes in the general price level.

¹⁶ The advantage of a national ever-normal-granary program to livestock production in the United States was stressed in Geoffrey Shepherd's bulletin *Controlling Corn and Hog Supplies and Prices*. Dr. Shepherd did not overlook, however, that in the case of any price stabilization program "dangers as well as benefits are in prospect"; and in his recent book on *Agricultural Price Control* (Ames, Iowa 1945) as well as in his paper for the *Contest of the American Farm Economic Association* (this JOURNAL, November, 1945) he suggested to combine feed-price stabilization with flexible prices for human food crops.

Since other participants in this contest also made proposals for supply stabilization by national stockpiling, it may be appropriate to stress the difference between ever-normal-granary programs that primarily look at "stabilization of physical supplies" (as William H. Nicholls put it in the First-Award Paper) and international buffer-stock proposals that also (or even primarily, as in the case of the proposal of the League Delegation) look at the mitigation of cyclical fluctuations in prices and economic activity. Dr. Nicholls has stressed that his program of physical-supply stabilization needs to be supplemented by a program of "price and income stability" for "our entire national economy."

As a matter of historic interest, attention may be drawn to an ever-normal-granary proposal made before 1780 by Sir James Steuart in his "Dissertation on the Policy of Grain, with view to a Plan for Preventing Scarcity or Exorbitant Prices in the Common Markets of England" (*The Works of the late Sir James Steuart*, Vol. V, London, 1805).

Moreover, regional yield variations may offset each other, especially in the instance of commodities (such as wheat) whose production is spread over most of the agricultural regions of the world.

Nevertheless, a comparison of the Liverpool prices for cotton and imported wheat with the variation in the size of the world crops of the respective commodities reveals that these prices (which are considered as representative for the world market) have repeatedly declined following a large crop, and increased following a small crop. In the case of cotton, price declines deviating from the general trend followed the large crops of 1908, 1911, 1924, 1925, 1926, and 1937; and price increases deviating from the general trend followed the small crops of 1909, 1915, 1922, 1923, and 1934. In the case of wheat, price fluctuations in a direction contrary to the change in the size of the world wheat crop occurred in many years prior to World War I and during the interwar period.

How important the stabilizing influence on producer income of price fluctuations in response to variations in the size of the crop can be has been demonstrated by F. A. Pearson and W. I. Myers in an analysis of some agricultural prices and incomes prior to World War I.¹⁷ In regard to wheat, the interrelationship was as follows:

	Short crops (as percentages of normal)	Big crops (as percentages of normal)
Prices	125	83
Farm Income	100	100

Since farm production costs are rather inflexible, price fluctuations in response to crop yield variations tend up to a point to have a stabilizing effect also on net farm income.¹⁸

¹⁷ "Effect of Production Controls on Farm Income," *Farm Economics*, No. 142, Department of Agricultural Economics, New York State College of Agriculture, Cornell University, Ithaca, New York, October 1944, p. 3619. In this study, crops 20% or more below normal were considered short crops; crops 20% or more above normal were considered big crops. It may be noted that the fluctuations of farm income were also very small in the instances of corn (102 for small crops—98 for big crops) and oats (98 for small crops—101 for big crops). They were somewhat larger in the instance of commodities that probably would not be subjected to buffer-stock operations, such as potatoes (103 for short crops—97 for big crops), hogs (97—103), and apples (94—106).

¹⁸ Only a few cost items, such as harvesting costs, fluctuate with crop yields; but even their flexibility has been reduced by mechanization. Mechanized wheat harvesting, for example, is often paid for per acre and not per bushel. The variations in harvesting costs are greater in those instances where a large amount of hand labor is used, such as still is predominantly the case in regard to cotton. Even where the variations in harvesting are fairly large, total costs per unit produced tend to vary in inverse proportion to yields. Take for example the five Northwestern wheat-producing States—Minnesota, North Dakota, South Dakota, Montana and Wyo-

In either case the unstabilizing influence on producer income could be reduced by keeping the margin between the buying and the selling price of the buffer-stock agency fairly large; but, as already stated (see p. 420), this would tend to reduce also the overall effectiveness of buffer stocks.

A preferable way out would appear to be to counteract these unstabilizing repercussions by means of crop insurance, such as is available for wheat, cotton, and flax in the United States. As crop insurance could probably be provided on a national basis only, questions would arise, however, as to the coordination of national and international action. Moreover, the administrative expenses of crop insurance are high relative to the premiums required for risk coverage; and the charges needed to cover these expenses, if crop insurance were to operate on a self-supporting basis, would tend to increase production costs. Governments would probably be called upon to defray these costs. They might even be called upon to make further contributions so as to avoid high premiums. Crop insurance subsidization, however, will not necessarily be an additional outlay; in many instances it will just be a more efficient form of continuing the relief usually provided for distressed areas.¹⁹

Moreover, crop insurance compensates individual producers in direct proportion to their losses. Therefore, its combination with price-stabilizing buffer-stock operations would not only offset a certain undesirable effect of those operations, but it would promise to secure a high degree of independence of farmers' income from the vagaries of nature.

4. *Long-run effects on the controlled prices.* Let us now turn from the short-term to the long-run effect that buffer-stock operations

ming. In 1936 when a severe crop failure in this area caused a large acreage to be abandoned and the yield to average only 6.5 bushels of wheat, the production costs averaged \$20.41 per harvested acre. In 1939, when the yield averaged 11.8 bushels, the costs averaged only \$10.28 per harvested acre. The costs per bushel varied even more; in 1936 they were \$3.14, and in 1939 \$0.87.

¹⁹ The *Report and Recommendations of The President's Committee on Crop Insurance*, Washington, December 1936 (p. 22) stated: "A crop insurance program, even for wheat only, should reduce to a considerable extent the necessity that has existed in the past for seed and feed loans, drought loans, and similar relief." Even though insured losses were in excess of expectations, experience, on the whole, has justified the statement recently made by Theodore W. Schultz in his book *Agriculture in an Unstable Economy*, (p. 218): "Society has been called upon repeatedly to bear a much larger share of the cost through various farm-relief measures than it would have to bear in a crop insurance program that did not entirely pay its own way."

The desirability of combining crop insurance with a program of stabilizing supply and price by stockpiling was stressed by a number of participants in the Contest of American Farm Economic Association.

as such (i.e., irrespective of secondary repercussions) would have on the long-run level of the controlled prices and subsequently on producer income and consumer outlay.

An analysis of this problem is handicapped by the difficulty of separating the effect of buffer-stock operations from the impact of other factors and by the uncertainty as to what prices would have prevailed in the absence of such operations. But even if, for the purpose of theoretical analysis, we assume complete knowledge of facts and perfect management, the only general conclusions that can be drawn are that (a) circumstances differing from commodity to commodity and varying in the course of time would determine whether buffer stocks would cause an increase in or a reduction of the long-run price level of the controlled products; and (b) the repercussions of this change in world market prices on the prices received by producers and on those paid by consumers might be altered by changes in marketing costs brought about by the buffer-stock operations; but here again it does not appear possible, on the basis of present knowledge, to state whether these changes would be upward or downward.

To show the possible effect of buffer stocks on the long-run level of the controlled prices, we assume that complete knowledge of facts enables us to determine the functioning of a market (1) under buffer-stock control, and (2) in the absence of such control. We assume, furthermore, that (a) the demand schedule, and therefore the position of the demand curve in the coordinate system, remains unchanged; (b) the volume of supply varies, but only because of a sequence of bumper crops and crop failures; (c) the long-term price trend in the uncontrolled market is even, and the price in the controlled market is maintained completely stable by the buffer-stock agency buying and selling unlimited quantities at this price; (d) over a certain period the same quantity moves into consumption under buffer-stock control as would have moved in the absence of such control; (e) this quantity is identical with the total output of the controlled product during the period in question; (f) in the uncontrolled market each year's crop is sold within that year while in the controlled market, as a result of the foregoing assumptions the annually sold amount equals the average annual production of the period in question.

Under these assumptions, the buffer-stock operations would neither increase nor decrease the long-run price level of the con-

trolled product (compared what it would have been in the absence of such control) if the controlled price equaled the weighted average of the prices in the uncontrolled market—using, of course, as weights the quantities sold at each price. Expressed in terms of the coordinate system, this means that the line of the weighted

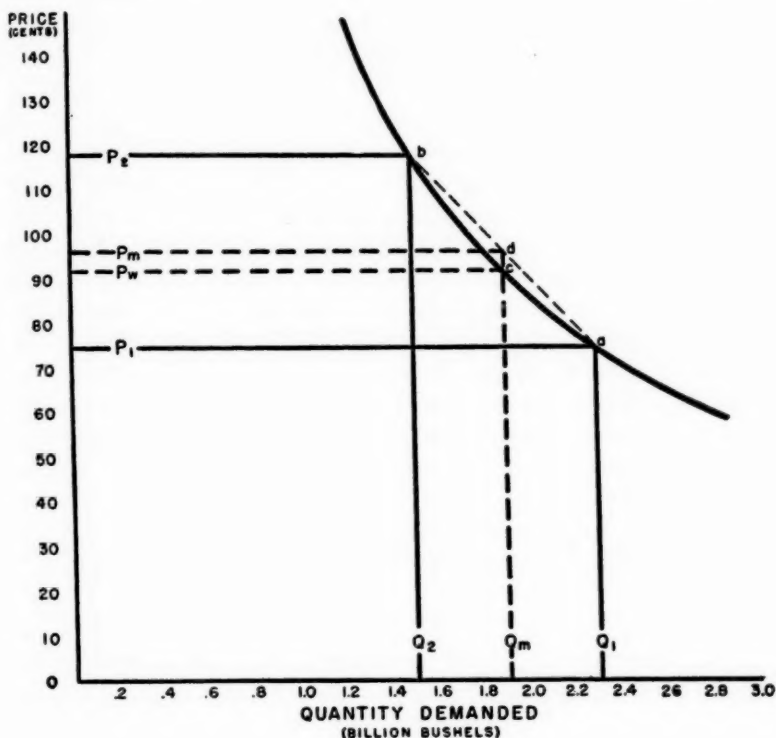


FIG. 1

average price and the line of the average annual production would cross at a point on the demand curve—as is the case in Figure 1.²⁰ Evidently this is a marginal case. If the demand curve were slightly less concave (convex to the origin), the market could be cleared

²⁰ The equation for this hyperbolic curve (rounded to one decimal) is $X = 1854.4(1/Y) - 5.6$; this curve has been fitted to rounded production and wholesale price figures for corn in the United States in 1935 and 1936 (2.3 million bushels and 75 cents in the first year and 1.5 million and 118 cents in the second). In Fig. 1, Q_m is the average annual output, P_w the weighted average price and P_m the arithmetic price mean.

only by setting the controlled price higher than the weighted average price; and in all instances in which that curve should be more concave the market could be cleared only by setting the controlled price lower than the weighted average price. Need for setting the controlled price above or below the average of the prices in the uncontrolled market may arise also as a result of changes in the demand schedule, or as a result of changes in the supply schedule due to other factors than fluctuations in crop yields.

Other circumstances being equal, deviation of the controlled price from the average of the prices in uncontrolled markets would affect the gross income of producers,²¹ and the outlay of consumers during the period of buffer-stock control. A higher controlled price would bring about an increase in producer income and consumer outlay; and a lower controlled price, a decrease in both of them.²²

It might be noted that other influences on producer income and consumer outlay are likely to result from the impact of the buffer-stock operations on production and marketing costs. On the one hand, the expenses involved in the buying and selling operations and in the stockholdings of the buffer-stock agency would tend to increase marketing costs.²³ On the other, the greater price stability and the availability of a ready buyer and a ready seller might lead

²¹ The effects of price stabilization on producer gross income are discussed by Frederick V. Waugh, Edgar L. Burtis, and A. G. Wolf in "The Controlled Distribution of a Crop among Independent Markets," *The Quarterly Journal of Economics*, November 1936.

²² Recently increased attention has been given to the effect of price stabilization on the so-called consumer's surplus. In his article "Does the Consumer Benefit from Price Instability?", *The Quarterly Journal of Economics*, August 1944, pp. 602 ff., Frederick V. Waugh has demonstrated for any demand curve sloping consistently downward and to the right that, if prices were stabilized at the arithmetic mean or above, the consumer's surplus would be reduced. In further development of this theorem and with the same assumptions regarding the slope of the demand curve, L. D. Howell ("Does the Consumer Benefit from Price Instability? Comment," *The Quarterly Journal of Economics*, February 1945, pp. 287 ff.) has shown that, if prices were stabilized at or below the weighted average price, the consumer's surplus would be larger than if prices were not stabilized at all.

The borderline between the cases in which the consumer's surplus would be increased and those in which it would be reduced will always lie in between the arithmetic mean and the weighted average price. Its location within this field will depend on the shape and slope of the demand curve and on its distance from the Y axis. However, since the position of this borderline will always be above that of the weighted average price, buffer-stock operations moving the same quantity into consumption as would move in the absence of such controls would increase the consumer's surplus not only in those instances in which they would reduce producer gross income and consumer outlay, but also in some instances in which they would slightly increase the latter two.

²³ This cost increase would, of course, affect producer income and consumer outlay only insofar as it were not being absorbed by subsidies.

to a reduction in certain cost items: it might reduce the importance of speculation and hedging and the costs resulting therefrom; it might make possible a more even use of resources (an effect that would be of particular importance in mining); it might stimulate simplification of marketing techniques; it might reduce the production and marketing risks; and it might lead to an improvement in the credit standing of raw-product producers and dealers and thus might enable them to borrow at lower interest rates. Even where such savings in production and marketing costs should be moderate in their absolute amount, as they would largely be, they might obtain importance in instances in which competition is close between a product whose price is being kept stable and a product whose price fluctuates considerably. An example is offered by cotton and rayon; some shifts of textile manufactures from the former to the latter have, in part, been explained by the smaller stockholding risks resulting from the greater stability of rayon prices.

5. *Effect on the development of the raw-product industries.* As the sharp fluctuations in raw-product prices are an important cause of disturbance in the development of agriculture and mining, a reduction in the scope of those price fluctuations would tend to exert a steadying influence on cyclical variations in the output of products subjected to buffer-stock control. In particular, such control should exert a retarding influence on such overexpansion as tends to take place in agriculture as well as in mining in response to price increases. In mining, buffer-stock control should reduce also the tendency toward destruction, during depressions, of subsequently needed productive capacity.

There are limitations to this steadying influence. Such limitations result especially from the costliness of the exclusive use of buffer stocks as a production-regulating device and from the inadequate response of production to price changes.²⁴

Though opinions differ greatly as to the maximum quantities that might be accumulated by an international buffer-stock agency, there is general agreement that if the stockpiling should be carried to extremes the costs would be out of proportion to the possible benefits. For example, in the case of certain minerals whose pro-

²⁴ The steadying effect of buffer stocks might be reduced also by abnormal production shifts such as would result from the changes in price relationships that rigid stabilization of raw-product prices would tend to cause during cyclical upswings and downswings (see above p. 420).

duction is comparatively limited in size and concentrated in a few places, the discovery of a rich new deposit might disturb the balance of supply and demand to such an extent that this balance could not be restored without a considerable change in price until the more accessible seams of the new mine have become exhausted. If, in such a case, the old mines that after some time will be needed again should be kept in full production in addition to the new and currently more productive mines, this might require the purchase of a large excess volume of output over a period of many years. It would, therefore, be "both financially and economically extravagant," as rightly stated by the League Commission.²⁵ If in order to avoid such extravagance prices were permitted to drop, the old mines would be sacrificed. If such a sacrifice as well as excessive stock accumulations are to be avoided, buffer-stock control of prices must be supplemented in a case like this by quantitative control of production, as has also been conceded by the League Delegation.

The need for such supplementary action would be even greater in the case of agriculture but for different reasons. In agriculture the danger is not so much that subsequently needed productive capacity would be destroyed because of depressed prices as that, in spite of depressed prices, a production volume that, for whatever reason, has become excessive, is being maintained.

In this instance the League Delegation was more optimistic. It suggested that "an international buffer-stock agency might have to carry stocks in excess of what would be required to smooth out cyclical price movements for a quite considerable time."²⁶ It insisted, furthermore, that "it would always be preferable to operate through buffer stocks alone when possible" and that "supplementary production control schemes" should be accepted "not as an obvious instrument, but as a last resort of policy."

In interpreting this suggestion, much must depend, of course, on where the borderline is being drawn between the "preferable" use of buffer stocks in dealing with surplus problems and the "last resort" use of production-control schemes. The Delegation did not clarify this point. It made only negative recommendations regard-

²⁵ *Op. cit.* p. 274.

²⁶ *Op. cit.* p. 272. This is equivalent to suggesting that the agency should deviate, in such instances, from the "most careful price policy," which the Delegation considers necessary as the first line of attack against "the risk of overproduction," conceded to be a "serious one" (see *ibid.* p. 270).

ing production control—in contrast with the unreservedly positive recommendations for buffer stocks.²⁷ But past experience with efforts to overcome a surplus situation by the means of stockpiling clearly suggests that the accumulation of excessive stockpiles is a very dangerous weapon. It may be used with advantage in special circumstances, such as the existence of a strong upward trend in consumption and a downward trend, or at least a much weaker upward trend, in production.

Such a coincidence of circumstances is not likely to occur frequently. On the contrary, as long as technical progress and the development of the resources of this earth continue at a fairly high rate, comparative advantage will tend to shift, and real costs of production will tend to decline; and, in view of the tendency of agriculture to maintain crop production even in the face of severely depressed prices, surplus problems are likely to develop and persist also in the future. This likelihood is being increased by the inheritance of maladjustments from the interwar period and by the production expansion for temporary needs during the war.

Theoretically, it would be possible for the buffer-stock agency to handle this situation by reducing the intervention price until the agency would no longer have "to carry stocks in excess of what would be required to smooth out cyclical price movements."²⁸

There could always be found a price level at which the demand and supply for any agricultural product would balance; but in many instances it would require price declines out of proportion to the adjustment need if agricultural adjustment were to be enforced solely through the instrument of the price mechanism. This is so because of the dependency of most farmers on their farms for their own and their families' existence, and because of the high percentage of fixed costs in crop production. Under such circumstances, enforcement of agricultural adjustment by means of the price mechanism alone would result in serious and prolonged distress for millions of farmers and farm families. Such action would seriously affect not only submarginal areas but also large areas of productive and efficiently cultivated land which from a long-run viewpoint should be kept in production. All the farmers and farm families on this land would be kept under depressed conditions until—after years of staying on and hoping for better times—a

²⁷ Ibid. Paragraphs 90–99 of the Summary and Conclusions (pp. 313 ff).

²⁸ Ibid., pp. 272.

sufficient number of farmers on submarginal land gave up producing. Meanwhile, the price pressure and the resulting economic distress would cause forced shifts in the ownership of thousands of good farms.

If such consequences are to be avoided, buffer stocks must be supplemented by production controls to an even greater extent than in the case of mining products.

6. *Buffer stocks and unilateral government intervention.* An international buffer-stock agency might be able to operate on the basis of the maintenance of a given scope of unilateral intervention by the various national governments; it would then have to consider this intervention among the factors determining the demand and supply situation. But with governments varying the scope and kind of their intervention as they do, the buffer-stock agency would be faced with an unpredictable political hazard, because any increase in the protection for domestic producers by importing countries tends to reduce the demand in the world market, and any new export subsidization, open or hidden as it may be, tends to result in larger supplies for the world market. Other changes in intervention policies might in other ways upset the assumptions upon which the buffer-stock agency might have made its plans.

Such prospects have rightly been viewed with concern. This concern was not shared by the League Delegation. On the contrary, this Delegation expressed the belief that "the creation of a buffer stock scheme would remove an important reason for protectionism because . . . it would very greatly diminish, if not remove altogether, what has been a real risk in the past—namely, that productive capacity which is again vitally required during a boom may be destroyed during a depression."²⁹

The basic assumption on which this optimistic statement rests is that the risk of destruction of subsequently needed productive capacity is "an important reason for protectionism." This assumption may hold true in regard to mining; but even here the validity of the League Delegation's conclusions appears to be reduced by the fact, stressed by this Delegation itself,³⁰ that, in the case of minerals produced in comparatively limited quantities and in only a few places, production controls need to supplement buffer stocks if the risk in question is to be removed.

²⁹ Op. cit. p. 273.

³⁰ Op. cit. p. 274 cf. also p. 427 above.

What is more important, however, is that the basic assumption made by the League Delegation does not in general hold true in crop production. Here the risk of destruction of subsequently needed productive capacity tends to be rather unimportant, and protectionism is resorted to mainly because of self-sufficiency policies and because of the desire of governments to prevent distress among domestic producers.

As to national self-sufficiency policies, their main roots are in security considerations of countries producing less of essential raw products than they need. Such countries might, up to some point, accept stockpiling within their boundaries as an alternative security measure if the stocks were held there permanently; but if the stocks were held there only until need should arise to sell them for price-stabilizing purposes, as would be the case under a buffer-stock plan, the long-run security value of these stocks would be open to doubts.

As to the prevention of producer distress, buffer stocks could be effective in reducing the need for action of this kind only in the case of products whose price fluctuations could be held around a level fairly remunerative to producers in exporting countries. But in the case of commodities in burdensome world surplus, buffer stocks could stabilize prices only at levels that would mean wide-spread and prolonged distress even for many producers in exporting countries, and still more for producers in importing countries if the latter were to abandon protectionism. Importing countries, therefore, must be expected to maintain protection by tariffs, quotas, producer subsidies, and similar measures; and exporting countries, having the burden of adjustment thrown upon them in such a manner, must be expected to continue fighting by the means of producer or export subsidies and similar devices for their share in what remains of the world market.

The buffer-stock agency evidently would be powerless against protective measures of the importing countries. But it could "limit purchases" from countries subsidizing exports, suggests the League Delegation.³¹ Such discrimination will at best be difficult. As stressed by Mr. Yates, "there are so many indirect and uncontrollable ways in which a government can assist particular groups of producers."³² Moreover, an exporting country could continue to sell

³¹ *Op. cit.* pp. 270 ff.

³² *Commodity Control*, London, 1943, p. 227.

at subsidized prices to countries not levying countervailing duties. This would take markets away from competing exporters and would force them to sell to the buffer-stock agency. Thus, far from impeding export subsidization buffer stocks would rather invite more export subsidization.³³ The difficulties resulting therefrom for the buffer-stock agency would be increased if governments in exporting countries should discontinue, as they are likely to do, production restrictions for commodities controlled by buffer stocks and reduce the scope of national stockpiling.

Effective protection of the price-control policies of an international buffer-stock agency against unilateral government intervention might be achieved by international agreements limiting and regulating such intervention. As the commodities in which burdensome surpluses exist and those for which government intervention has become extensive are largely the same, such agreement could contribute to the solution of the surplus problems as well as to the solution of the problems arising from unilateral government intervention; thus, these agreements could remove the two principal obstacles to effective buffer-stock operations.

Since conditions differ greatly in regard to various commodities, these agreements would have to be concluded on a commodity basis. While leaving the levelling-out of short-run price fluctuations to buffer-stock operations, they would have to coordinate government intervention in production and marketing so as to assure the long-run equilibrium of supply and demand at prices fair to both consumers and efficient producers and to facilitate production shifts in conformity with comparative advantage.³⁴

* * *

³³ Yates (*ibid.* p. 227) has stressed that, "since in the absence of quota arrangements the export market will go to the lowest bidder, buffer-stock control invites governments to compete in subsidizing their export industries; consequently, those forced out of production will not necessarily be the highest-cost producers, as the advocates of buffer stock schemes naively hope, but rather those who receive least government assistance."

³⁴ The scope of tasks of such arrangements are briefly outlined in *A Post-War Foreign Trade Program for United States Agriculture*. (U. S. Department of Agriculture AIS-15, 1945). The position of the agreements in an expansive trade policy has been discussed by Robert B. Schwenger in the article quoted above (footnote 11). As he pointed out (p. 85), the basic propositions in regard to such arrangements would be: "(a) international programming should be applied only when certain types of maladjusted situations arise; (b) the programs should call for intervention only to the extent required in order to accomplish their basic purpose; (c) the programs should, if possible, be designed to terminate the maladjustment which made them necessary and (d) they should be withdrawn as soon as that has been done. Only thus can the organization and procedure proposed become a helpful supple-

From the foregoing discussion it appears that buffer stocks could make a substantial contribution to the mitigation of cyclical influences on the raw-product sector of the economy and, in further consequence, on the economy as a whole. To accomplish this, they would, however, have to be operated so as to minimize certain undesirable repercussions, such as abnormal shifts in price relationships and in production between commodities controlled and commodities not controlled by buffer stocks. If this could not be done to a sufficient degree without weakening the beneficial effects of price stabilization, supplementary measures would be needed; an example is crop insurance, which would offset the unstabilizing effect that such stabilization has on farm income in instances of severe fluctuations in crop yields. Even more important a limitation on the usefulness of buffer stocks is their inability to maintain fairly remunerative prices against a downward trend in instances of inelastic supply. This, together with the weakness of an international buffer-stock agency to check unilateral government intervention, appears to justify the opinion of those who have demanded that, in the case of commodities in burdensome world surplus, buffer-stock operations be combined with international commodity agreements.³⁵

II. Operational Problems

The operational problems of buffer stocks are bound to vary in accordance with actual conditions of the production, marketing, and consumption of the various commodities. It would go beyond the scope of this article to discuss all these possibilities. Therefore, the following pages have been confined to discussing only a few basic problems of buffer-stock operations without consideration of the changes in the character of these problems that might be brought about by specific circumstances, as in particular international commodities agreements.³⁶

ment to, rather than an encroachment upon, a free economy." The State Department white paper *Proposals for Expansion of World Trade and Employment* (November 1945) contains concrete suggestions for the use of commodity agreements as an instrument toward such ends.

³⁵ The need may also be stressed for further research on the problems discussed in the foregoing—as, in particular the effect of buffer stocks on marketing costs and on the long-run levels of prices, producer income, and consumer purchasing power.

³⁶ It may be briefly noted that in the case of a commodity subject to production or marketing control by an international commodity agreement, the buffer-stock agency would have to keep within the framework of this agreement. Should the

1. *Buffer-stock operations and private speculation.* The operations of an international buffer-stock agency would have some similarity to the operations of a private speculator. Therefore, we can obtain some understanding of the scope of the problems with which such an agency would be faced by comparing its position with that of a speculator.

The basic similarity is that both, a buffer-stock agency and a private speculator, tend to buy when prices are low and to sell when prices are high. If either of them succeeds in doing this, and if he abstains from creating abnormal conditions in the market (such as speculators sometimes do by cornering supplies), this will tend to facilitate the equation of supply and demand, over time, and to reduce the magnitude of short-term price fluctuations. Yet in the case of buffer-stock operations this effect is intentional, whereas in that of speculation it is merely incidental.

During their activities, the buffer-stock agency and the speculator encounter certain expenses for overhead, market operations, storage, etc. and, as a result of the differences between their buying and selling prices, make profits or suffer losses. However, as distinct from the private speculator who aims at maximizing profits, the buffer-stock agency would be interested in profits only for the purpose of defraying expenses and accumulating reserves. It would have to assume greater risks and to forego chances for the realization of profits in the interest of price stabilization. It might even intentionally operate on a net-loss basis, if this were required in order to narrow the scope of price fluctuations or in order to smooth out price fluctuations along a downward trend. This would, of course, presuppose adequate provision for meeting these losses.

But different as are the goals of maximum profit in the one case and maximum reduction of price fluctuations in the other, the prospects for achieving either of these goals depend on whether or

agreement establish maximum and minimum prices, the buffer-stock agency could not raise its selling price above or lower its buying price below these ultimate limits. However, the agency would not necessarily have to be confined to buying at the minimum and selling at the maximum; it might well be directed to adjust, within this range, its buying and selling prices upward and downward in accordance with market trends as they become evident. On the other hand, if, by keeping within the set maximum and minimum, the agency should be faced with the danger either of accumulating stocks considerably beyond expectation or of exhausting its stocks, the agreement would have to be altered. This may be done by changing the price limits, by changing the production and marketing quotas, or by providing for a special surplus disposal program.

not the buying and selling prices are in conformity with long-run price trends.

The buffer-stock agency would require a much stronger financial basis than the speculator; this has rightly been stressed by the League Delegation. If, at any time, the agency were faced with the danger of having to interrupt either its buying or its selling operations because of lack of funds or commodity stocks, speculation would immediately go to work to precipitate a crisis.³⁷ On the other hand, great financial strength might become a temptation for the agency to hold on to a position even though it appeared to be contrary to the long-run price trend.

In general a professional speculator will adjust his market position more easily to new evidence regarding the price trend than the buffer-stock agency. For example, he will readily sell if a downward trend becomes apparent. He will sell even at a loss—because, after prices have fallen, he can turn the loss into a profit by repurchasing. Unless he fails to anticipate a panic, the relative smallness of his operations (compared with the total turnover in the market) makes it easy for him to change from a bullish to a bearish position and vice versa. And, insofar as the market as a whole is concerned, errors of some speculators often are corrected by better judgment, or at least better guessing, of others. Therefore, in spite of losses by individual speculators, professional commodity speculation as a whole seems, in the long-run, to have been successful in taking its position, in correcting its errors, and in making profits.

Because of the magnitude of its operations, a buffer-stock agency would be comparatively less mobile in correcting errors. On the other hand, if it were endowed with adequate financial strength, it would not need to take losses because of the inability, frequent among speculators, to hold a position until the trend changes. Should the agency operate in the markets of various commodities it would also be able to compensate losses suffered on one commodity by profits gained on another. But, should it err in its anticipation of the general price trend, it would suffer losses all along the line; and, beyond that, it might exert an unstabilizing effect on the prices of all controlled commodities. Moreover, even though it were

³⁷ It may be noted that for various reasons, and especially because of the danger of being cornered, it does not appear feasible that a buffer-stock agency protect its position by the sale of "futures." The question of whether or not it should buy "futures," as is sometimes suggested, appears in need of further study.

left entirely free to decide its buying and selling policy (which it almost certainly will not be), the agency could not sell in a declining market simply because of some prospect for repurchase later on at a lower price. On the contrary, it would have carefully to avoid even the mere appearance of trying to make profits through changing its prices. As rightly stated by the League Delegation,³⁸ "the buffer-stock agency *ex hypothesi* could not modify its price limits very frequently or widely."

2. *Problems resulting from the intergovernmental character of a buffer-stock agency.* There is general agreement among the proponents of buffer-stock operations that only an intergovernmental agency could be entrusted with the great responsibility of controlling world market prices. It is also considered desirable that this agency be formed by governments of importing as well as exporting countries, so that the interests of both consumers and producers be represented in its management. The League Delegation hopes that this will prevent prices from "being fixed too high."³⁹

Agreement between participating governments will, of course, have to be reached on all important principles governing the operations of the agency. Probably countries will insist on rigid amendment provisions in the agency's constitution.⁴⁰ Even if this should not be the case, important issues would have to be settled by agreement in order to avoid secessions.

The problems on which intergovernmental agreement must be reached will include such matters as the price policy of the agency, its finances (provision for capital stock and guarantees, sharing of profits and losses; determination of limits within which the agency should take risks, etc.), the scope of the authority for accumulating stocks, the price margins between different qualities and different places, the determination of the markets in which the agency should intervene (which would involve leaving the adjustment of the prices in the other markets to arbitrage operations of private business or of governments), and the attitude of the agency toward unilateral action by member governments or by outsiders.

³⁸ Op. cit. p. 273.

³⁹ Op. cit. p. 268.

⁴⁰ In comparison, it may be noted that the Articles of Agreement of the International Monetary Fund and the International Bank for Reconstruction and Development provide that certain important amendments be made only by unanimous vote and certain others only by consent of three-fifths of the members having four-fifths of the total voting power.

3. *The non-intervention margin.* A "non-intervention margin," i.e. a spread between the buying price and the selling price of the buffer-stock agency, would tend to be a source of revenues, welcome for the payment of operating expenses and the accumulation of contingency reserves; but this should not be the paramount consideration. If the agency were not fully self-supporting, though effectively promoting a better development of the world economy, the participating countries would probably be willing to contribute to its costs as they do in the case of other international agencies. Conditions may develop under which it would not be feasible to operate the buffer-stock agency on a self-supporting basis; for example, in the case of a long-term downward trend of prices losses would have to be taken. Moreover, there are also limits to the possibility of increasing revenues through widening the spread between the buying and the selling price. Too large a non-intervention margin would keep the agency out of the market for long periods, during which no revenues would be earned, but storage costs and other expenses would accumulate.

Although it is too early (as rightly stated by the League Delegation) to decide how large this margin should be, it may be noted that a margin of 20 percent above and below a standard price (as suggested in the form of an example by the Delegation⁴¹) would permit price increases up to one-half of the floor and price declines down to one-third of the ceiling. This could certainly not be called "preventing short-term cyclical fluctuations in price."⁴² Finally, it must not be overlooked that even a very large spread would help the agency to earn revenues only if the standard price were kept in proper relationship to the long-run price trend. If this should not be so, even a 20 percent margin above and below the standard would not do more than reduce losses, as will become evident from a subsequently analyzed example.

4. *Determination of the standard price.* Since it is impossible to evaluate price fluctuations in advance with a reasonable degree of certainty, the setting of the standard price will, unavoidably, involve considerable arbitrariness.

Because of their concern with the producer or consumer interests likely to be affected by such decisions, governments must be expected to object to leaving these decisions to the free discretion of

⁴¹ Op. cit. pp. 266 ff.

⁴² Op. cit. p. 313, paragraph 90.

the management of the buffer-stock agency. International agreement would therefore have to set the rules guiding the agency's price policy. These rules would have to state how the initial standard price should be determined, and when and how this price should be adjusted to changing conditions.

Three principal possibilities seem to exist for choosing the initial standard price: (a) some arbitrarily picked price, (b) the average price of a past period of several years, or (c) the currently prevailing price.

The arbitrary setting of a standard price would presuppose either general consensus regarding the probable price trend, which will hardly ever be obtained, or an international agreement on the maintenance of a certain price level by production and marketing controls.

To choose as standard the average price of a past period (the League Delegation⁴³ suggested the last 8-10 years) might have the advantage of starting with an intermediate price level, but only if the chosen period comprises a full business cycle. However, because of the varying length of business cycles, it is, in general, not possible to determine when a cyclical movement has been completed. Take, for example, the crop year 1929. In that year prices were in general fairly stable, and the wheat price in Liverpool (which might be considered as representative for the world market) recovered slightly after a drop from 181 in 1924 to 128 in 1928. This drop had brought it down to about the lowest level thus far reached in the post-war period (127 in 1923). A cycle seemed then to have been completed;⁴⁴ but we know now that the major part of the downswing was still to come. Furthermore, economic disturbances (such as war and inflation accompanying it) may have affected prices in the preceding years so as to deprive them of long-run significance; and the prices of an earlier period may no longer be representative for the situation after such a disturbance. There is, furthermore, the possibility that the average of the prices in the base period deviates considerably from the current price level. If, as it would

⁴³ Op. cit. p. 266.

⁴⁴ Actually the expectations in the fall of 1929 were rather optimistic. As E. S. Haskell, *Stabilization Operations of the Federal Farm Board*, New York, 1933, (p. 8) stated, "the 1929 world crop was expected to be 500,000,000 bushels under the large crop of 1928. Carryovers in exporting countries were known to be large, but European countries were expected to import heavily. Both official and trade sources generally anticipated higher prices than those prevailing."

have to be the case, buffer-stock operations should begin during a downswing, and if the prices during the preceding period should have been relatively high, the standard calculated on this basis would tend to be substantially above the current free-market price. Even though intervention purchases were undertaken only on the basis of a lower floor price, the result might be that the agency would have to use up its resources faster than desirable. And, if the ceiling price were correspondingly higher, it might also find itself prevented from selling during a considerable period.

The third possibility, namely fixing the initial standard on some current basis (e.g., the average price of the last 12 months), might also get stabilization operations started at a level considerably deviating from the long-run trend with the result that substantial adjustments of the standard would be required later on; but it would involve the least difficulty in the beginning.

5. *Adjustment of the standard price by the method of moving averages.* So far as this writer knows no practical suggestion has thus far been published for the adjustment of the standard price to changing conditions.

The League Delegation has referred to a suggestion for adjusting this price in conformity with a moving average of the prices of a preceding period of say 8 or 10 years. This does not appear to be a workable formula, however.

In the first year of operations the average would be one of uncontrolled prices, or at least of prices uncontrolled by the buffer-stock agency. Yet in the course of time controlled prices would successively replace uncontrolled prices in the moving average. Thus, this system would tend to perpetuate the influence of the base period.

Such perpetuation would be complete if the buffer-stock agency should maintain no spread between its buying and its selling price. The suggested method would then consist merely in a progressive averaging out of the prices of the base period. The range of price fluctuations that it would permit to take place would be comparatively narrow even during the first operational period equal in length to the base period; it would be further narrowed in any subsequent period; relatively soon it would become insignificant. An application of this formula to the Liverpool wheat price, taking the crop years 1921 to 1928 as base, gives a standard price of 152.75 cents; this would have been the controlled price in 1929

had stabilization operations commenced in that year. In calculating the standard for 1930, the 1921 price would have had to be replaced by the controlled 1929 price, and so forth. This would have given the following series of standard prices: 152.75, 152.97, 154.09, 157.48, 154.54, 151.85, 150.46, 150.27, 153.05, 153.09, 153.10, 152.98, 152.92, 152.15, 152.19, 152.41, 152.67, and so forth; that is, prices fluctuating less and less around the original standard of 152.75.

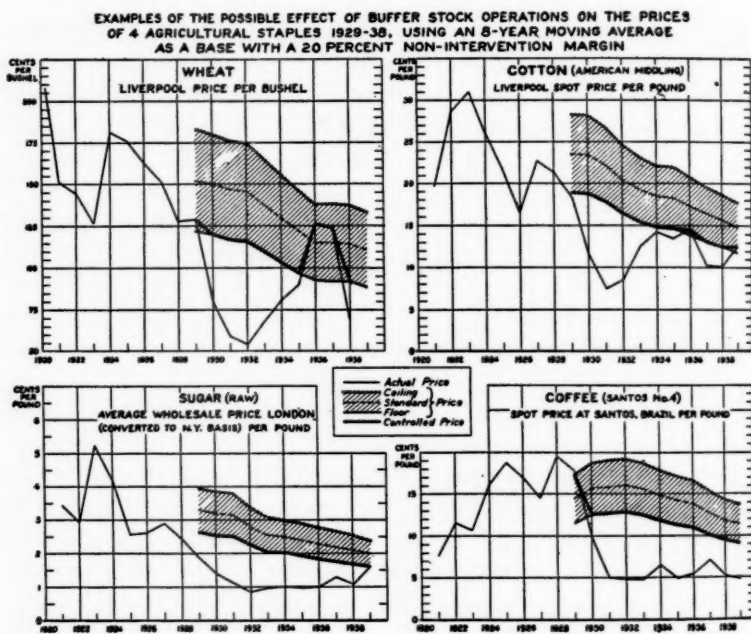


FIG. 2

If the operations aimed only at maintaining a floor and a ceiling below and above the standard, changing conditions would exert some influence on the controlled price, but this influence could be exerted only within the currently prevailing "non-intervention margin."

Figure 2a shows what effect an eight-year moving average would have had on the Liverpool wheat price between 1929 and 1938 if this price had remained unaffected by secondary repercussions of the stabilization operations, and if the buffer-stock agency had

maintained a floor price 20 percent below and a ceiling price 20 percent above the standard. Under these assumptions, the buffer-stock agency would have had to make support purchases during 7 out of those 10 years, and in none of them could it have made any sales from the accumulated stocks. In the absence of war and of other important extraneous influence upon the price structure, considerable time would probably have been required before the standard determined by such a formula could have been lowered sufficiently to permit the buffer-stock agency to sell at the ceiling price (i.e., 20 percent above the standard). Meanwhile very substantial stocks would probably have been accumulated. Favorable repercussions of the buffer-stock operations might have improved the situation, but unfavorable ones, such as production expansions in the supported commodities, might have worsened it.

Figures 2b-2d show that the danger of a breakdown of the buffer-stock operations would have been even greater in the case of cotton, sugar, and coffee.

6. *Standard price and stockholdings.* If the danger of having to accumulate unwieldy stocks—and the still greater danger that, in the face of persistent stock accumulation, resistance against buffer-stock operations might lead to the breakdown of the system—is to be avoided, a more flexible formula must be developed. Perhaps this might be done by tying the price policy of the buffer-stock agency to its stockholdings; because changes in the stocks are a definite indication of the strength of the price trend as well as of the strength of the secondary repercussions of price stabilization.

It may be tentatively outlined how such a system might be developed and operated—assuming that operations began during a downswing.

After the initial standard price, its seasonal variation, and the percentage margins for the floor and ceiling prices were set, an estimate would be made of the quantities that might have to be bought annually during a cyclical downswing and sold during an upswing in order to stabilize the prices of a certain raw product within such floor and ceiling. In addition, an estimate would be made of the lengths of the downswing and the upswing. Agreement would authorize the management to buy unlimited quantities if the market price dropped to the floor and to continue such buying as long as the so-accumulated stock remained below the total of estimated annual purchases for the respective year of the down-

swing. If at any time the accumulated stock should exceed this total (say twice the estimated annual purchases during the second year), the agency would lower the standard price proportionately to the excess increase in the stock. If this should not suffice, the standard would be lowered at an increasing rate (say at a rate of 125 percent during the first year, 150 percent during the second, and so on). Provision for a progressive lowering of the price would have to be made also in the event that the duration of the downswing should exceed the estimated length.⁴⁵

If, at any stage in the development, the market price should increase to the currently prevailing ceiling, the agency would sell from the accumulated stock as much as needed to prevent a further price increase. But if such sales reduced the stock by more than estimated for the respective stage of the downswing (say during the third year of the downswing by more than three times the annual amount), the standard would be raised in a way similar to the manner in which it would be lowered during the downswing. Similar action would be taken should the upswing continue beyond its estimated length.

An intervention system of this kind would probably be less in danger of exhausting its funds (or stocks) than the system outlined by the League Delegation. Moreover, flexibility of the stabilization operations in conformity with the changes in stocks would make it possible to keep the non-intervention margin narrower than under the other system. It might also reduce the distorting effect of price stabilization on price relationships, and it might even permit some (though probably only an inadequate) price response to variations in crop yields.

To reach agreement on such detailed instructions to the management of the buffer-stock agency as needed for a flexible price policy would, of course, require difficult negotiations. This must be viewed as a consequence of the complicated structure of the price mechanism, which resists correction by a simple mechanical device, and which ultimately allows intervention to succeed only if the intervention either conforms to the changes in the demand and supply situation or alters this situation through quantitative controls.

⁴⁵ Should world-wide inflationary or deflationary developments tend to change the general level of prices, additional adjustments of the standard might be required. Possibly this might be done by changing the standard price "in accordance with the index number of general prices" as suggested by Lord Keynes in the letter quoted above in Footnote 16.

As pointed out in Part I, the choice between these two alternatives will depend mainly on whether the level at which buffer-stock operations could stabilize the price of a raw product will be high enough to prevent widespread and prolonged depression among its producers. If this could be done, buffer stocks could be made the sole device of international commodity control; if not, they would have to be combined with international commodity agreements and operated within the framework of these agreements. In either case, buffer stocks could make an important contribution to the improvement of economic conditions in the raw-product industries.

PRODUCTION AND WELFARE OBJECTIVES FOR AMERICAN AGRICULTURE*

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AT MEMPHIS, on November 12, 1945, Secretary Anderson put squarely and succinctly the very important question which I want to discuss here, namely, *what do we mean by equality for agriculture?* Can equality be defined both in qualitative and quantitative terms, and can this objective be put in a social, political, and economic context consistent with the values of our society? Furthermore, can equality for agriculture be achieved within the framework of our democratic state? I want to know whether equality for agriculture can be achieved *with economy* in the use to which our scarce resources are put. The Secretary has succeeded in focusing the main issues, an important first and necessary step. In doing so he has raised some very difficult and unsettled problems. I shall address myself here chiefly to the economic ingredients of the more important of these unsettled issues.

Before doing so, however, let me make several observations with regard to the setting of our agricultural problem. As leading officials of the U.S.D.A. you are charged with its administration, and in that capacity you are primarily concerned with the *production* of farm products and *welfare* of farm people. That, I assume, is your province in the governmental division of labor here in Washington. I shall presume that it is your wish to examine and appraise these two objectives in a national context, see them as an integral part of the entire economy.

Looking ahead one cannot be sure whether a new era with high employment and expanding prosperity or with low employment and depressed conditions will unfold; whether inflation or deflation will rule. We know that VJ-Day plus three months has not given us enough time to achieve peace and good will among nations. Many more months are likely to elapse before we are successful in emerging from this post-combat period with its vexing national and international difficulties. Meanwhile, many uncertainties confront the United States as we try to redetermine our place in for-

* This paper was read before the top officials of the United States Department of Agriculture on December 3, 1945. It is published here as it was read and accordingly should be studied against the operations and policy objectives of the U.S.D.A. at the close of 1945.

eign affairs and as we convert our economy to peacetime jobs and markets.

Many of you are apprehensive that agriculture will find it hard to make the transition from war to peace. Are you afraid that farm surpluses will soon dominate the agricultural scene? If this is your belief and you prepare to deal solely, or even primarily, with the contingencies associated with farm surpluses you will be badly prepared, in my judgment, for the farm problems that are likely to arise in 1946. The task of administering the U.S.D.A. will not be that simple, for the problems ahead will have more than one dimension. There are likely to be some surpluses but also some real scarcities. Some of these will be of your own making.

It would be exceedingly unfortunate if we rely heavily upon the experiences, the thinking, and may I say, the slogans of the emergency period of the 'thirties in formulating lines of action in agriculture for the next few years. We are, as the Secretary put it at Memphis, rapidly moving into a new era. A little thoughtful speculation should convince one that the outlook now does not have much in common with that of the 'thirties, nor does it resemble the years after World War I. Both the magnitudes involved and the tempo at which we are moving are very different. We need, therefore, to reassess the primary characteristics of our unstable economy.

U.S.D.A. Is Now Very Inflexible

This brings me to my first critical assessment regarding the unpreparedness of the U.S.D.A. Under the mandates which legally specify the functions and operations of the U.S.D.A. and with the machinery which is at hand, the agricultural policies and programs of the U.S.D.A. have become altogether too inflexible. Price supports, including commodity loans, have been put into a straitjacket by the parity rates now specified by law. Many farm products will soon lose touch with the market, both domestic and foreign, as a consequence. This unprecedented inflexibility means in fact that the U.S.D.A. cannot deal effectively with the problems that are likely to arise in postwar agriculture in our unstable economy. It should, however, be obvious that flexibility is the key to any rational approach to the uncertainties that overhang the years immediately ahead. Unfortunately in agriculture, however, we have locked the door, and we have mislaid the key. The first order of business must be the recovery of enough flexibility in prices, loan

rates, storages, conservation, and in food programs to cope successfully with the various types of food and agricultural situations that are likely to arise. Both in its policies and programs the Department of Agriculture will require both *more built-in flexibility* and *more latitude for administrative discretion* in handling the transition.

The basic legislation in behalf of agriculture now in force dictates a course of action that will hinder instead of help farm people adjust to peacetime markets. Present legislation will in fact create certain farm surpluses (eggs, potatoes, cotton and wheat, for example) instead of bringing supply and demand of such farm products into balance, it will in some cases reduce farm income, and it will put much farm land to undesirable uses; in addition, it may even worsen appreciably the distribution of income among farm families. All of these developments are now in prospect. This is a very high, and what is more, an unnecessary price for agriculture and the nation to pay, but it is the price which we will pay for this inflexibility unless it is corrected by new legislation. What we have done in farm prices, commodity loans and storages is like locking the instruments that control a ship after setting them so that the ship must follow a rigid course despite high waves, treacherous rocks and shoals that beset the path.

I

As part of the setting of this discussion let me list briefly the resources and demand conditions affecting agriculture which I assume as highly probable as we emerge from the war. These assumptions are:

1. That as a consequence of the mobilization for war the agricultural production of the United States has expanded about one-fourth, and that most of this additional production will continue;
2. That the farm population and the labor force in farming has dropped very considerably during the war years, and they are likely to remain below prewar levels;
3. That the efficiency of human effort in agriculture has risen sharply during the war, and it will rise further during the coming decade;
4. That the demand for farm products for war and for current relief has increased more than the supply, but much of this addi-

tional demand will disappear during the next two years; nevertheless, the demand for farm products during the next decade will be substantially larger than it was before the war but it will be erratic, fluctuating widely from year to year;

5. That the per capita income of farm people will be somewhat better than during prewar years, but for at least half of the people in agriculture it will be below other major occupational groups in our economy;

6. That large areas of agriculture will be burdened by an excess supply of labor resources and the attendant low earnings of persons engaged in farming in those sections;

7. That the basic necessary readjustments in the allocation of resources affecting agriculture will entail a two-way movement of resources—(1) people leaving agriculture for other occupations, and (2) capital flowing into agriculture to conserve soil and to buy machinery and equipment and for other purposes; and

8. That in terms of welfare most farm people will be substantially below other major groups, and upward of half of them near or below what this country considers as minimum levels.

II

Also as part of the setting in discussing *equality for agriculture* there are important policy issues outside of agriculture for which farm people must assume their full share of responsibility. We must always remember that Uncle Sam does not live on food alone. Production and welfare in agriculture are obviously only two items in a national bundle of policy objectives. High on the list and of broad importance are monetary-fiscal, foreign trade, employment, relief, security, health, and others. What is done in each of these can add strength or introduce weaknesses into our economy. Let me observe with regard to three of these as follows:

1. *On trade.* The essential facts in this sphere are not in dispute. The United States is now the dominant country in economic matters by the sheer nature of its size and efficiency and attendant productive capacity. Our factories and farms do not await rehabilitation. They are going concerns. The war has not devastated our capacity to produce. Instead it has taught us a priceless lesson, for we now know what we can do when we operate at full employment. Our unique economic position in the world places upon us a major

responsibility to lead and direct the formulation of the trade patterns to be followed in the years ahead. This opportunity is now in our hands, as it was with Great Britain for so many decades.

What are we to do about this responsibility? What patterns do we want international economic relations to take?

1. Do we want tighter quotas, higher tariffs, and more state controls for wool and other imports?
2. Do we want still more price discrimination, larger export subsidies, and more state controls to dump cotton and other exports?
3. Do we want to use our credit to force countries to buy in our markets at parity prices in financing relief and rehabilitation abroad?
4. Do we want more international cartels and commodity agreements to advance the interest of special producer groups regardless of their adverse effects abroad?
5. Do we want to export our maladjustments in agriculture and our unemployment in industry and thereby burden other economies?

Surely these are not the objectives of a rational trade policy befitting the responsibility and interest of the United States. Yet these are the patterns that will emerge if the goals for which many groups in agriculture are now pressing, were to prevail. American agriculture is well on the way to becoming the Gibraltar of economic isolationism. This drift adverse to postwar trade is occurring despite the fine record and the leading role this country has had in the development of F.A.O. Obviously, I would be unfair if I were to place responsibility for this anti-trade development in agricultural circles upon the U.S.D.A. Yet in all honesty I must say that there are agencies and officials in the Department of Agriculture who are nurturing, rationalizing, and defending these many new forms of commodity isolationism with little or no regard for the national interest and for our responsibilities in international affairs.

2. *On monetary-fiscal matters.* Monetary-fiscal policies and programs must play a major role if we are to attain high employment with the area of decisions of private firms and households as large as it is in the United States. Obviously agriculture has a primary stake in an over-all demand sufficiently large to permit full employ-

ment at high production. Yet agriculture is in danger of backsliding in the monetary-fiscal field. The grand interest of farm people in earlier periods focused on the value of money, national banking policy, the management of the public debt, public revenue and expenditures, long before economists "discovered" that monetary-fiscal policies were not only relevant but essential in attaining high employment and a stable price level, is being dissipated today. Most farm leaders are focusing upon the prices of particular commodities and in so doing are losing sight of prices as a whole and policies appropriate for keeping the aggregate demand large enough to keep all of our resources employed.

3. *On food and feed for relief.* We cannot escape the fact that unless the United States acts promptly, the approaching winter and spring will bring to the people of Europe worse hunger than under Nazi tyranny. The food and feed situation in Europe is critical. Our responsibilities during this post-combat period are not being met. It is to be regretted that we have forgotten that grand slogan, "Food will win the war and write the peace." This country has become in fact an island of luxury in a world of misery, a world suffering from hunger, lack of fuel and inadequate clothing. In addition to what is now being made available to Europe several million tons of food and feed are required to see Europe through the next 6 to 12 months. Not only food is needed, but so is feed to help restore livestock and poultry production. Meanwhile we are about to waste much feed in producing eggs and other products which will prove hard to handle when they are marketed. As I see it our post-combat responsibilities consist of four parts: (1) We should stand by with aid to the United Kingdom so that the food of the British people will, at least, not drop below wartime levels; (2) we should contribute enough additional food to the liberated countries of western Europe to lessen the privation, especially of city people, striving for over-all diets of about the level of 2650 calories per person per day; (3) we should authorize the army to acquire and distribute sufficient food in ex-enemy countries to prevent starvation and widespread malnutrition; (4) we should make good to the full on our contributions to UNRRA in order to bring much needed aid to the people of eastern Europe and of parts of the Orient.

These contributions are not the kind that can properly be handled by granting credits. This food and feed should be given as

a post-combat gift from the United States, not as charity but in a spirit of our genuine concern for human lives and our recognition of America's stake in the welfare of Europeans. But instead we have done all in our power to appease American consumers and also producers, even though it has given rise to an uneasy conscience among our people.

III

Having touched upon the inflexibility of the legislative mandate of the U.S.D.A. and some related background matters, I shall now examine briefly the idea of equality for agriculture. Let me try to express this idea so that it can be resolved into meaningful and significant components. I need to point out, first, that the concept of equality for agriculture is in substance an end to be achieved, an objective; and, therefore, it is not one of the means to be employed in administering our economy. Second, it is necessary to distinguish between the objective and the means that may be appropriate in achieving, in this case, equality for agriculture. Once we have disentangled measures from goals we will put aside most of the confusion that has characterized discussions of this topic.

Policies and programs are by definition (and in operation) *means*. They are instruments in our society for attaining social, political and economic objectives. In an economic context both *prices* and *incomes* are of the nature of means; in production, they act as incentives to producers, and in welfare, income acts as purchasing power for people. Neither prices nor incomes are in any ultimate sense of the nature of ends. The connection between prices and incomes on the one hand, and equality for agriculture on the other, is as *means are to end*.

We now need to make certain what it is we mean by the two decisive terms, namely, "agriculture" and "equality." Let us take "agriculture," first. What does it signify? Agriculture, of course, connotes more things to people than did the elephant to the blind men each describing the part he had at hand. Our concern here, however, is with agricultural policy, that is, policy for the point of view of economic analysis. In this context agriculture has two primary foci, namely:

- (1) *Agricultural production*—the use of resources to produce farm products, and
- (2) *Welfare of farm people*—the distribution and utilization of income among persons on farms.

But we have not formulated agricultural policy along these two lines. Not having done so has led us to make several serious mistakes. One of these mistakes has arisen from the belief that solving the production problems in agriculture perforce solves the welfare problems of farm people. To put this belief another way, it assumes that efficient production—using the best crop and livestock practices, on farms of the proper size, with low cost credit, conserving the soil, and marketing wisely—will by itself provide farm people with the necessary incomes to attain acceptable standards of welfare. As a result of this belief the primary emphasis has been on the production of food, feed, and fibers and very little directly on the welfare of farm people. A second mistake has been the practice of mixing production and welfare into a policy brew so spiced that no one could distinguish one ingredient from another. This mixing of policy objectives has led to much confusion and waste; all too often, as a result, particular farm programs have improved neither production nor welfare. These errors have led to a serious neglect of the welfare of farm people, and it is no wonder that farm people have fallen behind the non-farm population in education, nutrition, housing, modern medical facilities, free time, old age and disability benefits, and other phases of social security. In a deeper sense we may well regret that these two foci inherent in agriculture were not put into the name of this important department, for agriculture might have fared much better if at the outset the title, Department of Agricultural Production and Welfare, had been applied. Or better still, The Department for Farm People instead of the Department for Farm Commodities.

This dualism within agriculture rests on a functional dichotomy of *resources for production and income for welfare*. It is very important to make this separation in properly formulating our present-day problems in agriculture. From the point of view of society in terms of political economy, the objective in production should be put as follows: To achieve economy in the use of resources. The test for this achievement is allocative efficiency. In welfare the objective should be stated along these lines: A level of income, a distribution of income among persons, and a utilization of income to achieve the highest attainable level of welfare. Here the test of achievement is in social efficiency. Production, therefore, from the point of view of political economy should be geared to allocative efficiency, and welfare should be meshed into social efficiency.

The second decisive term is "equality." What does it mean? Is it feasible to put the idea of equality into objective terms so that it will have meaning in analysis and in practice? The answer, I feel sure, is wholly negative unless we divide agriculture into production and welfare and apply the appropriate test to each.

We can conceive and define equality in the economy of production where the test is allocative efficiency, and the indicator for this test is to be found in the rates of return of resources used in agricultural production. When the rates of return of capital, land, and labor resources are less or more than the rates of return for similar capital, land, and labor in other fields of economic endeavor, equality does not exist. This formulation gives us an operational test, one that can be applied in practice. Moreover, the test I propose has a firm foundation in economic analysis and it can, therefore, be made rigorous and objective. What is even more, it would provide us with a new basis for determining parity, a parity in production based on allocative efficiency on which economy depends.

We can also conceive of equality in the sphere of welfare where the test is in terms of social efficiency and where the indicators are to be found in those aspects of welfare in which society has a concern. In this case the comparison turns on education, nutrition, housing, security, and medical services because they are important parts of welfare. Since minimum standards are the recognized first objective as our society has taken measures to improve welfare, the test is not overall equality between families within agriculture, or between families in agriculture and the rest of society, but whether or not these minimum standards are being realized.

My contention is that equality for agriculture need not be an empty, wholly subjective and essentially meaningless agricultural objective in public policy. When we see clearly the dichotomy inherent in agriculture, namely, that of production and welfare, one focusing upon resources and the other upon the lives of farm people, agricultural policy can be given both qualitative and quantitative dimensions consistent with the social, political, and economic values of our society.

I want to press on and make somewhat more explicit the steps that are necessary in formulating policies that will make a maximum contribution (1) in the field of production, and (2) in the field of welfare. To do this we should set up our income accounting in

such a way as to provide guides to policy. Last spring I addressed myself to this problem in a paper before the Western Farm Economics Association, and in closing let me draw briefly upon that paper to show the steps that would be required in income accounting to help guide production and welfare policies.¹

Income Accounting for Allocative Efficiency

An ideal accounting system should tell us whether it would be possible to increase the total output by changing the use to which any resource is put. In applying this principle to agriculture the alternative uses of resources appear to fall into three broad classes: (1) within farms, (2) among farms, (3) between agriculture and the rest of the economy.

The principal economic concepts and theory that are required for developing statistics designed to measure income as incentives to resource owners are well known and fairly straightforward. The following major steps would be necessary:

- (1) Ascertain the amount of income "produced" in agriculture,
- (2) Allocate this income to each resource in accordance with its value productivity,
- (3) Calculate the rate of return realized by each resource, and
- (4) Compare the rates of return (a) within farms, (b) among farms, and (c) between farms and the rest of the economy.

The significant data in all of this, concerning the allocative efficiency with regard to resources, are the rates of return. Comparisons of the rates of return would give us an indicator, a parity² that would be meaningful as a guide in policies designed to improve agricultural production. To illustrate, if the rate of return for human agents in farming is less than in other sectors of the economy, a *disparity* is deemed to exist (caused presumably by a malallocation of resources). It follows from this that the total output of the nation could be increased by the movement of labor resources out of agriculture into other occupations, in sufficient numbers to equalize the rate of returns for comparable labor inputs. If at the same time the rate of return for workers engaged in farming is higher in the Western States than in the Cotton Belt, a *disparity* exists (AR/ER is less than unity) among farms (in this case by regions). Here again a gain in national production may be achieved by labor moving out of the South into the West (and into non-agricultural occupations at the same time) until the rates of return are equalized.

This procedure of testing and determining the proper allocation of resources is, of course, also applicable to the production within farms (and fully as valid when applied to non-agricultural production). This "within

¹ *Proceedings of the Western Farm Economics Association*, "Income Accounting to Guide Production and Welfare Policies," pp. 58-66.

² When $AR/ER=1.0$, parity would exist (in a production context) with R as the rate of return, A the agricultural resource and E the equilibrium rate for comparable resources. As AR/ER fell below 1.0 a disparity adverse to the agricultural resource, and as it rose above 1.0, a disparity favorable to the agricultural resource, would prevail.

farms" has been the sphere to which farm management studies have been devoted. We must also compare the rates of return for various capital forms such as land, buildings, fences, machinery, equipment and fertilizer, relative to the market rate for capital. The test is as valid here as it is in the case of labor resources.

The basic purpose of income accounting in this context should be clear and unmistakable: It is to measure the rate of return of each of the various resources employed. The task as here outlined is no easy one; it presents many very difficult problems of a statistical nature. Yet it can be done, at least by stages, from very rough approximations to more refined and dependable estimates as data and methods are forged.

We know even now from the essentially unplanned and unorganized statistics and from direct observations that the rates of returns for comparable resources are far from equal among farms in the same type-of-farming areas, among farms by regions, and between agriculture and the rest of the economy. Any inequalities in the rates of return is a true measure of the inefficiency and waste that prevails and characterizes American agriculture. These inequalities have been very considerable even during war.

One thing, accordingly, must be borne in mind always—the rates of return are the crucial indicators in achieving economy in the use of the nation's resources. They provide the measurement that is necessary, they make possible on the production side a meaningful and valid parity. Unlike the present legal price and income parities which have no economic content in an overall supply-demand context, parity for production based on the rates of return, as herein outlined, would have meaning in economic analysis. This parity would be useful to policy makers and economists alike. Moreover, parity, based on rates of return, can be generalized; for the procedure for determining this parity is fully as applicable to secondary and tertiary industries as to primary production.

The indicator growing out of the proposed income accounting developed in this section may appropriately be called the *production parity*.

Income Accounting for Social Efficiency

Here, too, it is well to start by formulating the guiding principle. It may be put thus: The ideal accounting system for this purpose should indicate whether it is possible to improve the social efficiency of a people by changing the personal distribution and use of incomes. In focusing upon agriculture the alternatives with respect to the personal distribution and use of income may be grouped along the following lines: (1) among farm families, and (2) between farm and non-farm families. . . .

Without probing further at this time the analytical foundations for welfare, a system of income accounting designed to measure how incomes affect the social efficiency of farm people, would appear to require the following steps:

1. Ascertain the amount of income "received" by farm families,
2. Determine the personal distribution of this income by families,
3. Calculate the purchasing power of the income realized by families

(in terms of acquiring—by means of purchases in markets and through public services—the essentials for social efficiency including nutritious food, education, housing, clothing, free time, and the attendant goods and services),

4. Compare the realized incomes (a) among farm families, and (b) between farm and non-farm families.

Here again, the significant data that emerge from this kind of income accounting concerning social efficiency and the personal distribution and use of income lie in the comparisons of realized incomes. The goal, however, would not be that of achieving equality in realized incomes measured in terms of purchasing power for goods and services (including those available on public account) essential to social efficiency. The bench mark would be different from the production side in this respect: in the efforts of our society to improve welfare, minimum standards have become the first objective.³ These minimum standards must, therefore, be translated into incomes. It follows that whenever families with realized incomes too small to permit them, within the cultural and market complex in which they are situated, to obtain the necessary goods and services to satisfy these minimum standards a welfare *disparity* is deemed to exist.

Again it should be noted that a parity⁴ based on this kind of a comparison (of income realized and minimum standards) is fully as valid when applied to non-farm families as it is for farm families.

Income accounting on the pattern outlined in this section will provide the data for an indicator that may well be called the *welfare parity*.

These two approaches separate sharply the function of income as incentives to resource owners in which the test is allocative efficiency from the function of income as purchasing power available to families with which to acquire necessary goods and services to permit them as people to be socially efficient.

The utility of the two systems of income accounting proposed in this paper should be fairly obvious. They go to the heart of some of the more vexing, unsettled problems arising in American agricultural policy. These income accounts would point the way as to what should be done about parity. They also would provide an answer to the question: Can parity be given a solid economic foundation?

On the side of agricultural production the proposed indicators would give significant clues with regard to the efficiency with which resources are allocated within farms, among farms, and between agriculture and the

³ A second objective, more comprehensive in its scope and in its significance in economic analysis, is to equate "investments" in human agents so as to maximize the expected aggregate productivity of a people. This objective would require going much further in increasing the public "investments" in people than that specified by so-called minimum standards. This formulation of welfare, converting social efficiency back into the essentials for productivity, casts the problem so that one can apply marginal analysis in its solution.

⁴ When $RFI/NFI = 1.0$, parity (in a welfare context) would exist—with RFI as the realized family income and with NFI the necessary family income to acquire the minimum standards. Most families in periods of high employment would presumably show a parity higher than unity.

rest of the economy. We can anticipate some of the disparities that would become evident.

Under non-war conditions, for some time to come, we are likely to have a very considerable disparity adverse to labor resources engaged in most parts of American agriculture, especially in the South. If our proposed income accounting were to confirm this expectation, what implication would this fact have to policy? Does it mean that prices of farm products should be increased? Obviously that is not the remedy, for to raise the price of cotton will neither solve the poverty of the South nor induce an efficient use of resources. The policy implications are really very straightforward. In a secular context agriculture is burdened with an excess supply of labor. We might speculate with regard to the causes. Certainly the rapid advances in farm technology, largely labor saving in their effects, is a factor. So is the high natural increase of the farm population. More basic, however, is the fact that for a long time (as a consequence of industrialization and the low income elasticity of farm products), the growth of the supply of farm products has been more rapid than the demand. It should be the objective of policy, therefore, to improve the distribution of the nation's labor force and to accomplish this it is necessary to reduce the excess supply of labor in agriculture to a point where rates of return for human effort would be equal to that in other occupations.

In the case of capital we are likely to find that the rates of return in farming, again particularly in parts of the South, are considerably higher than the market rate for capital. The policy implications are plain—more capital in the form of farm machinery, equipment, and soil resources is needed in those parts of agriculture. Measures, therefore, should be undertaken which will increase the amount of capital employed in farming. The main barriers are, however, deep-seated. Many farm families with little or no equity are confronted with much price and yield uncertainty and are subject to capital rationing. It is no easy matter to correct the adverse effects of this situation.

In the case of welfare considerations it is a serious mistake to proceed on the assumption that all farm families receive incomes that are too small to permit them to enjoy a high or even a moderate level of living. It is also a mistake to assume that because the price of wheat or of cotton is low that, therefore, all families engaged in producing these products receive low incomes. On the welfare side we might expect our income accounts to show that most farm families in the Corn Belt, in the milk sheds, and in several other areas receive incomes as high and higher than the majority of the families in the non-agricultural sectors of the economy.

Nevertheless, agriculture is likely to have, under conditions of high production and employment, more than a proportionate share of the nation's families who do not receive enough income to provide for themselves the essentials for social efficiency. Does the remedy lie in higher farm prices, acreage allotments to reduce crop acreages, commodity loans, support prices, and parity payments of pre-war vintage? The answer is, of course, that none of these measures is appropriate for improving the social efficiency of farm people. Whereas such programs may or may not

contribute to a better use of resources in agricultural production, they definitely are not suitable for improving the personal distribution and use of income.

When these two types of income measurements have been established we will find that there are some policies which will improve both *production* and *welfare*: The following measures fall into this group, namely, policies that (1) reduce the excess supply of labor in agriculture, (2) lessen the capital rationing in agriculture, (3) enlarge small inefficient farms, (4) lessen the price and yield uncertainties confronting farmers, and (5) increase public investments in human agents. Personal income taxation, the extension of old age and survivor's benefits to farm people and income payments to farm families that are progressive in their effects are likely to improve the personal distribution and use of income without worsening the allocation of resources. There are also policies that would improve allocative efficiency on the resource side without worsening the personal distribution and use of income, for example, most of the technical researches of the U. S. Department of Agriculture and the State Agricultural Experiment Stations fall into this group. Then there is a third group, including several of the major agricultural policies which this country has been pursuing, which instead of improving, actually worsen both the allocative efficiency and the social efficiency of the American economy; these are: (1) the maintenance of farm product and resource prices either above or below their equilibrium value—this is bound to happen when support prices for farm products are determined according to the legal parity, when the Commodity Credit Corporation makes loans based on prevailing legal parity; (2) income payments to farmers based on size of farm, on a corn, wheat, cotton or tobacco acreage allotment or on some other measure of the productive capacity of the farm; (3) barriers that keep the excess supply of labor from leaving agriculture; (4) the sub-division of the existing, already too small, farms into smaller more nearly "subsistence" farms; and (5) an increase rather than a decrease of the prevailing price and yield uncertainties in agriculture.

THE ECONOMY OF SMALL FARMS IN WISCONSIN*

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FAMILIES on small farms in the United States find themselves in the cross-fire of two opposing sets of powerful forces; one sustaining them while the other crushes. The forces tending to squeeze out these families on small farms are the increasing cash costs of family living and the continued improvements in farm machinery which increase the amount of land a family can handle. Forces tending to maintain small farms are the inability of most families on them to accumulate savings to purchase additional land and the demand for small farms by families with limited savings and less attractive alternatives.

National farm organizations differ sharply in their support of specific governmental policies as a result of a wide cleavage regarding the importance of shaping policies in the interests of small farmers. Farm machinery companies, having rather fully exploited the larger farm market, are now planning a large variety and number of implements adapted for use on small farms. Yet at the same time agricultural leaders point out that the mounting of farm machinery on pneumatic tires and a number of other recent developments have increased the competitive advantage of larger farms.

Speculation regarding the permanence of the wartime decline of the agricultural population to the record low of 15 percent of the country's total, and the probability of its continued fall, turns in part on estimates of the relative strength of the demand of families for small farms as a home, a way of making a living, and a haven of security in an uncertain world versus the demands of commercial farmers for larger units of operation in the interests of higher incomes. A key factor in the situation will be the opportunities available for nonfarm jobs and the working and living conditions associated with them.

Anticipating that interest in this field will continue to increase in the next few years, a study of the smallest one-third of the full-time farms in the better farming areas of Wisconsin was under-

* The author is especially indebted to John B. Bowditch and John Kutish, graduate assistants who participated in the field work and analysis, and John M. Brewster of the Bureau of Agricultural Economics for suggestions on organization of the materials.

taken in the summer of 1945. This study was designed to throw light on recent trends in their numbers, the characteristics of the farming found on them, the living conditions of the families operating them and to permit an evaluation of the social and economic problems associated with their consolidation or continuation as independent units.

Location and Limits of Sample Studied

Cropland was believed to be the best single measure of size available for Wisconsin farms and for this reason the limits of the sample selected for study were defined in terms of cropland rather than total farm land. Twenty-five townships, not adjoining urban centers of 5000 population or more, were selected as representative of the better farming areas of Wisconsin (Fig. 1). (The central sandy area and the northern cutover counties were excluded in order to limit the study to those sections of the State dominated by commercial agriculture.) Frequency distributions constructed from AAA data indicated that 36 percent of the farms in these townships had less than 59 acres of cropland. It was assumed and later verified in the field that farms with less than 20 acres of cropland (7 percent of the total) were seldom full-time farms. As a result the size range 20 to 59 acres of cropland was selected for study as roughly the smallest one-third of the full time farms. A random sample of approximately 150 farms with 20 to 39 acres of cropland and 150 with 40 to 59 acres of cropland in the townships indicated in Figure 1 where the operator did not work off the farm more than 60 days during the year was finally selected for study.¹ A few specialty farms such as those raising fur-bearing animals were eliminated from the random sample.

Ten Percent Decline in Farm Numbers in Eight Years

It was found impossible to utilize AAA records in a study of trends in numbers of farms having specified acreages of cropland. For this purpose the assessors' enumeration of farms in these same

¹ Most of the farms studied would be classified as commercial family farms in the classification proposed by Benedict and others in "Need for a New Classification of Farms," *This JOURNAL*, vol. 26, no. 4, pp. 694-704. Eleven percent of the farms might be classed as retirement farms (operators over 65 years of age). Six of the farms with operators less than 65 years old produced less than \$600 worth of produce at 1939 prices—the criteria for subsistence farms. Only 8 percent of the farmers visited were part-time operators and these were eliminated from the study.

townships in 1936 and 1944 was analyzed. In 1944 assessors enumerated only 3896 farms in contrast to the 4493 farms listed on AAA records.² Eight years earlier, in 1936, the assessors had enumer-



FIG. 1. Location of townships in which the 302 small farms studied were located. Almost all the farms with 20 to 39 acres of cropland in these townships were included in the study. It also included over half of the farms with 40 to 59 acres of cropland.

ated 4349 farms in these townships—a decline of 10 percent in 8 years.

² This is largely because the AAA defines each tract of land having separate ownership as a farm while the assessors' definition is based on the operating unit. Only complete operating units are enumerated in this study.

Consolidation has not been limited to farms with small acreages of crops. There was a decline in the number of farms in every size group up to 95 acres of crops and only a small increase in the number of farms with more than 124 acres of crops (Table 1). Farms

TABLE 1. NUMBER OF FARMS HAVING SPECIFIED ACREAGES OF HARVESTED CROPS IN 25 WISCONSIN TOWNSHIPS, 1936 AND 1944

Size group	Number of Farms		Percent Decrease
	1936	1944	
Under 15 acres crops	172	118	-31
15- 34 acres crops	503	411	-18
35- 49 acres crops	814	740	- 9
50- 64 acres crops	961	873	- 9
65- 79 acres crops	720	561	-22
80- 94 acres crops	441	410	- 7
95-109 acres crops	293	292	- .3
110-124 acres crops	170	154	- 9
Over 124 acres crops	275	337	+23
Total	4349	3896	-10

Data from Wisconsin Crop and Livestock Reporting Service.

with 50 to 64 acres of harvested crops continue to be the most numerous. The sample of farms studied for the most part had from 15 to 50 acres of harvested crops, a range which included 30 percent of all farms enumerated by the assessors in 1944.³

Small Farms Have Less Productive Soils

It might be expected that the families on the small farms in part compensated for their limited acreages by having land of above average productivity. Our investigation indicates that small farms in Wisconsin probably average lower rather than higher in quality of soil resources in comparison with their neighboring larger farms. In the more level areas of southern and eastern Wisconsin the small farms are often found on the more rolling or less productive sections of the townships. In the western rolling to rough sections of the state, farms with small acreages of crops are often the roughest farms in the neighborhood. They sometimes are as large in terms of total farm land as adjoining farms but have only a

³ AAA records, which were used to define the limits of the sample because of their availability for locating the farm, define cropland to include land which has formerly grown crops (usually rotation pasture) as well as harvested crop acreages. Rotation pasture accounted for 12 percent of the cropland on the larger farms and 13 percent on the smaller farms studied.

small acreage adapted for crop production. Although the men making the field studies observed a tendency for the farms in their sample to be rougher than average for the community, the farms with 20 to 39 acres of cropland had 46 percent of their farm land in crops; farms with 40 to 59 acres of cropland had 51 percent in crops. This is approximately the same as the situation found on farms keeping accounts. These farms had an average of 81 acres of crops and 47 percent of their farm land in crops.

Such small acreages of crops were grown on each farm that it was not feasible to obtain reliable estimates of yields except for oats. The oat yields on the small farms averaged 47 bushels an acre which is approximately the same as the average yield of 46 bushels reported by the Wisconsin Crop and Livestock Reporting Service for all the counties in which the farms were located. Thus we come to our first conclusion: farms in Wisconsin with small acreages of cropland do not have important offsetting advantages in terms of higher quality soil resources and higher crop yields.

Land Not Used Intensively

The pressure for income on small farms has been recognized as an important factor retarding soil conservation adjustments. It is often assumed that operators of small farms tend to offset their limited resources by using their land more intensively than do operators of larger farms. But this is not the case—in Wisconsin at any rate. Operators of both big and little units farm their land in about the same way. Almost half the cropland is in hay on both the small and the larger farms. The farm account farms with an average of 81 acres of crops had a somewhat higher percentage of intertilled highly erosive crops (Table 2).⁴

⁴ Unpublished data in a master's thesis prepared by Erven Long, University of Wisconsin, covering 3400 farms in southern Wisconsin in 1942 indicate that the larger farms in Wisconsin have a somewhat higher percentage of cropland in corn and lower percentage in hay than the smaller farms.

Crop acres per farm	Percent of cropland in			
	Corn	Small grain	Hay	Other
20-39	24	32	41	3
40-59	25	32	40	3
60-79	27	35	35	3
80-99	29	34	33	4
100 and over	30	36	29	5

These data do not fully answer the question: Is the land on small farms being exploited more rapidly than the land on adjoining larger farms? As indicated earlier the land on the small farms may be somewhat more rolling and if so it would erode more rapidly under similar tillage practices. The amount of fertilizer used and

TABLE 2. USE OF CROPLAND ON SMALL AND LARGER ACCOUNT FARMS, WISCONSIN, 1944

	Farms under 40 crop acres		Farms 40 to 59 crop acres		Farm account farms	
	acres	percent	acres	percent	acres	percent
Alfalfa hay	4	15	6	13	10	12
Mixed hay	8	29	11	25	21	26
<i>Total hay</i>	<i>12</i>	<i>44</i>	<i>17</i>	<i>38</i>	<i>31</i>	<i>38</i>
Corn silage	3	11	6	14	9	11
Corn grain	4	15	6	14	14	17
Cash crops	1	4	2	5	4	5
<i>Total intertilled</i>	<i>8</i>	<i>30</i>	<i>14</i>	<i>32</i>	<i>27</i>	<i>33</i>
Oats	7	26	13	30	23	29
<i>Total crops</i>	<i>27</i>	<i>100</i>	<i>44</i>	<i>100</i>	<i>81</i>	<i>100</i>

the extra manure from feed bought are other important considerations. Comparable data are not available for all the larger farms in the better farming areas of Wisconsin, but less fertilizer and feed is bought per acre of land in crops on the small farms than on farms which keep records.

	Farms under 40 crop acres	Farms 40 to 59 crop acres	Account farms (81 crop acres)
Fertilizer per crop acre (dollars)	1	1	2
Feed per crop acre (dollars)	6	7	13

Small Farms are Diversified

Somewhat less than half of the small farms studied grew a cash crop such as tobacco, potatoes, or peas. In the tobacco growing areas each farm had a small acreage of tobacco, but the entire sample included only 33 farms out of the total 302, on which tobacco was grown. A few farms had special enterprises or markets which gave them profitable employment for extra labor in addition to the common farm enterprises. These included selling dressed poultry and hatching eggs or selling milk in special markets. The more general practice, however, was to follow about the same sys-

tem of farming as prevailed on the neighboring larger farms. The livestock numbers per farm were as follows:

	20 to 39 crop acres	40 to 59 crop acres
Cows	9	12
Other cattle	5	5
Chickens	90	108
Horses	2	2

All farms raised hogs for home butchering and many raised a few to sell each year. Contrary to popular belief few depended on poultry as an important source of income; only 7 families had 300 or more chickens.

Labor Saving Machinery Common

There has been much public discussion of the extent to which families on small farms can afford to own and operate modern labor saving machinery. The data indicate that approximately two-thirds of the farmers on 40 to 59 crop acre farms have tractors and, probably even more significant, almost one-half of the smaller farms have them. The manure spreader, another important labor saving machine on a dairy farm, was found on most small farms. The hay loader was about as common as the tractor. The percentage of farms having specified machines is as follows:

	20 to 39 crop acres	40 to 59 crop acres
Tractor ⁵	41	64
Tractor cultivator	17	26
Manure spreader	60	80
Grain binder	62	78
Corn binder	43	76
Hay loader	40	62
Truck	14	22
Car	86	96
Milking machine	17	45

A number of the farmers interviewed mentioned the fact that they would have purchased a new piece of machinery within the past year if it had been available. Undoubtedly as soon as supplies are available, many farmers not now equipped with tractors and other important labor saving machinery will purchase these items.

⁵ Approximately half of the tractors were 8 years old or over on both groups of farms. Other machinery tended to be older with as many as 75 percent of some machines, such as grain binders, over 8 years old.

One might expect operators of these small farms to do considerable custom work with their more expensive equipment in order to reduce overhead costs. Only 12, however, reported custom work, and most of these 12 had either a silo filler, hay baler, tree sprayer, thrasher, or wood saw with which they did work off the farm. The combination of a small farm and some highly specialized equipment used part time for custom work—a plan suggested as desirable for mechanically talented farmers with limited resources—has not found much favor among the present operators of small farms. One man now doing custom work with a hay baler expressed dissatisfaction with his present program and indicated he expected to sell his baler and move to a larger farm as soon as possible. Apparently the operators of these smaller farms are able to equip themselves with the more important labor saving machinery. But few are sufficiently concerned about the high overhead costs on small acreages to undertake custom work.

The labor force on these small farms is to a considerable extent adjusted to the small acreage of crops and numbers of livestock. In contrast to the usual family farms in these sections of the state, the labor force is 20 percent to one-third smaller and the volume of work to be done one-third to one-half smaller. As a consequence the crops and livestock cared for per man equivalent on the farms with 20 to 39 acres of cropland were one-third less and on the 40 to 59 acre farms 17 percent less than on the larger family farms.⁶ The figures are as follows:

	Farms 20 to 39 crop acres	Farms 40 to 59 crop acres	Typical farms (66 crop acres)
Labor force (man equivalent)	1.04	1.21	1.51
10 Hour days productive work	228	335	498
Days productive work per man equivalent	219	276	330

Buildings on Small Farms

Many families reported substantial improvements on their house or outbuildings in recent months made possible by their wartime incomes. The more important information relative to the building situation on these farms is summarized in tabular form as follows:

⁶ These are called "typical" farms in *Production, Income and Expense on Typical Farms in Wisconsin, 1935-43, Economic Information for Wisconsin Farmers, Jan.-Feb. 1945.*

	20 to 39 crop acres	40 to 59 crop acres
Percent having electricity	65	75
Percent having running water	23	25
Percent having central heating	23	28
Percent of houses in fair or good condition	89	95
Average rooms per house	7	8
Percent of barns in fair or good condition	79	96
Percent who made building improvements of \$50 or more in 1944	50	46
Percent of barns with extra space for 2 or more cows	58	63
Average extra space per barn (number cows)	5	5

After allowing for a possible substantial sampling error, it appears safe to conclude that not over 5 percent of the families on small farms are living in shelters so small or poorly constructed that the families' health may be affected. Similarly not over 5 percent have inadequate barn shelter for their dairy cattle. A higher proportion have inadequate housing for their poultry since poultry is not considered an important enterprise on many of these farms.

The high value of the buildings on these small units has been an important factor retarding their consolidation. In the years immediately ahead the high value of the buildings will be even more of a deterrent factor for the prewar high rate of depreciation has been arrested by major repairs in recent months. Wartime incomes are being reinvested in building repairs and remodeling on these farms just as they are on the larger farms. Seldom did the interviewers find a family which believed that there was an economic advantage in allowing the buildings on their small acreage to deteriorate in anticipation of consolidating it with an adjoining farm. Probably fewer than 10 percent of the families are allowing their buildings to depreciate to the point where they will be inadequate as the headquarters for a small dairy and general farming enterprise within the next 10 years.

On most of these small farms the buildings are adequate for a larger acreage than is being farmed at the present time. The tabular data presented earlier indicate that over half these farms have extra barn room for dairy cows. On the average it would take about a 50 percent increase in crop production on the farms with extra barn room to feed the dairy herds which would fill their barns. The availability of this extra housing capacity for dairy cows may be a substantial economic force acting to increase the size of some

of these small acreages at the expense of adjoining larger farms, although as will be shown later, few of the families planned to expand their farming operations.

Incomes Earned on Small Farms

The average gross and net income on farms interviewed having 20 to 39 acres was \$2290 and \$1230 in 1945. Farms having 40 to 59 acres had an average gross income of \$3320 and net income of \$1640.

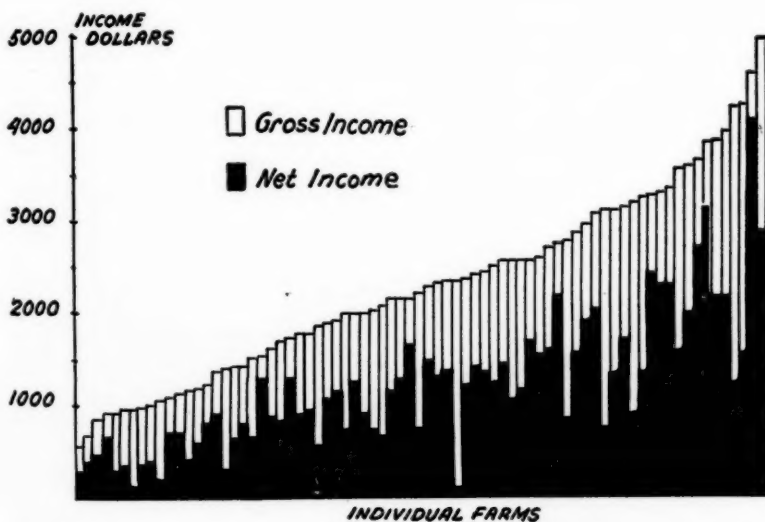


FIG. 2. GROSS AND NET INCOME REPORTED BY 75 FARMS WITH 20 TO 39 ACRES OF CROPLAND, 1944

The income data were taken from the farmers' copy of income tax form 1040F and adjusted for differences in interest paid and any sale or purchase of capital assets reported, without including depreciation. Almost all farms reported income on a cash basis.

Farm prices in Wisconsin in 1944 were approximately double their 1935-39 average and net incomes were around 3 times as high.⁷ With these wartime influences 26 percent of the families on farms of 40 to 59 crop acres and 5 percent on the smaller farms had gross incomes over \$4000. The corresponding figures for gross incomes over \$1500 are 96 and 75 percent. Figures 2 and 3 show

⁷ "Production, Income and Expense on Typical Farms in Wisconsin, 1935-43," *Economic Information for Wisconsin Farmers*, Jan.-Feb. 1945. The income situation in Wisconsin in 1944 was about the same as in 1943.

the gross and net income for each individual farm for which income and expense information were obtained.

A decrease of 25 to 35 percent from 1944 price levels would result in the net income dropping at least one half. This is probably as high incomes as these farm families can expect in the years ahead

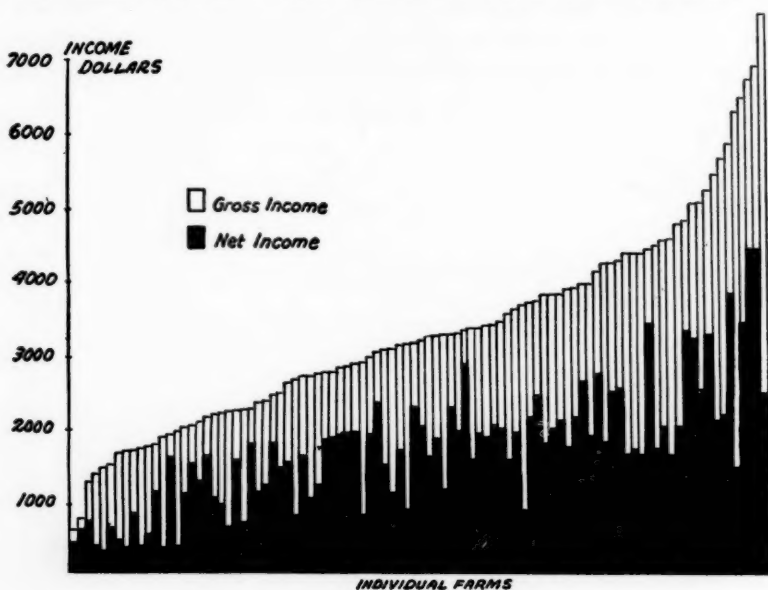


FIG. 3. GROSS AND NET INCOME REPORTED BY 95 FARMS WITH 40 TO 59 ACRES OF CROPLAND, 1944.

See Figure 2 for an explanation of the income data. In both this figure and Figure 2 there is no distinct modal grouping of the incomes for these farms with a small acreage of crops. Twenty-five or 26 percent of these farms reported net incomes in excess of \$2000.

unless they change their farming practices. If net incomes are cut in half, 27 percent of the families would receive less than \$400 net cash income for family living, debt payments and saving.⁸ Several factors tend to minimize the social problems created by this low income situation for these families.⁹ A number of them have no

⁸ Maddox estimated that at prewar prices a family income of \$820 was required in the northern states to meet minimum needs for a family of 5. This includes the value of housing and products furnished by the farm. A comparable figure for price levels assumed above would be \$1030. "A National Program of Rural Rehabilitation and Relief," this JOURNAL, vol. 21, no. 4, 1939.

⁹ In national terms relatively few of these farms are low income farms. Only 8 percent of them had gross cash incomes of \$1200 or less. At 1939 price levels this is the equivalent of \$600 or less. In contrast almost 48 percent of the farms enumerated

children or their children have grown up and left home. Others with children have them work away from home when not in school, and many are free of debt.

Causes of Differences in Incomes

The wide variation in gross and net incomes on these farms immediately led to an investigation of the ways in which the higher income farms differed from those having the lower incomes. Did the high income farmers follow special systems of farming? Were the low income farms handicapped with respect to quality of land, ill health of the operator or in some other manner? Were they operated by old men who had lost their vigor?

These small farmers as a group had lower production per cow and per hen kept than either the average for all farms in their section of the state or the better farmers who kept farm accounts. The approximate figures are as follows:

	All small farms	All farms in area ¹⁰	Farm account farms
Milk per cow (pounds)	5400	6000	7500
Poultry and egg sales per hen (dollars)	2.50	3.80	(not available)

A careful analysis of the farm to farm variations in income indicated those with the high incomes had somewhat better than average soil resources. In addition they bought more fertilizer, raised and bought more feed, kept more livestock and obtained higher production per cow and per hen than those with low incomes. There was no significant difference in the type of farming followed on the two groups of farms. The sources of income were as follows:

	40 low income small farms ¹¹ percent	40 high income small farms percent
Dairy products	65	64
Poultry and eggs	12	9
Cattle and calves	8	8
Hogs	6	6
Cash crops	4	11
Miscellaneous	5	2
	100	100

in the 1940 census had a gross value of products sold, traded or used in the home of \$600 or less. Only 23 percent of the farms had gross product values of \$1500 or over. Forty-five percent of these small Wisconsin farms had gross cash incomes of \$3000 or more which at 1939 price levels would have been the equivalent of \$1500 or more.

¹⁰ Computed from Wisconsin Crop and Livestock Reporting Service data.

¹¹ For purposes of analysis the 20 high and low income farms with 20 to 39 acres of cropland and the same number of farms with 40 to 59 acres of cropland were summarized separately. Since there was no significant difference between the two size groups they were combined. The 40 farms in each case are made up of the 20 highest and lowest income farms in each size group.

These findings, while not surprising, are significant. The differences between the high and low income farms primarily appear to be in the quality of the management. The small difference in soil resources and all other variables are unimportant in comparison. There was no significant difference in the age of the operators of the two groups of farms, the operators of the 40 low income farms had an average age of 50 years; the comparable figure for operators of high income farms was 48 years.

The Human Side of Small Farms

Having seen their resources and the reflection of these resources into agricultural income, the question arises as to the human side of small Wisconsin farms. What manner of life do they sustain? What is the nature of their operating families in terms of age, health and education; their previous occupations, experience and plans for the future; their financial and tenure conditions, and their appraisal of their lot in life? These are matters of overshadowing import. For in the final showdown, it is mainly in terms of the human side of farms rather than in standards of technical efficiencies that policies take shape and find their justification.

There is much evidence of economy in family living on these small farms, but little evidence of hardship. Malnutrition is probably as infrequent as on the larger farms in the Midwest. Almost all of the families had dairy products, beef, pork, poultry, eggs, vegetables, and fruit available for home consumption from their farming operations which were an important factor contributing to their health and well being.

No doubt the high wartime incomes gave the interviewers a somewhat biased picture of the economic problems encountered by the families. In spite of the relatively low incomes in normal times there was little evidence that these families had been a burden on their community. They appear to be taking part in community life and maintain their farmsteads as well as their neighbors. The interviewers often made notes indicating the farmsteads were well arranged and cared for and had an attractive appearance. Notes on the schedules also indicated that the individuals in the families often impressed the interviewers with their intelligence and pleasant personality.

One of the indications of the standard of living maintained by these families is their children's attendance at high school. In this

respect they are above the state average. Of 146 children between the ages of 14 and 22 years, 65 percent had attended high school one or more years. Of those 18 to 22 years, 40 percent had completed high school. These figures exceed the state average for comparable age groups as reported in the 1940 census. The state average percentage of 14 to 22 year olds who had attended one or more years of high school was 46; of the 18 to 22 year olds 31 percent had completed high school.

Family Characteristics

Families on small farms in Wisconsin differ little from other farm families with respect to age, health, and number of children. There was some tendency for the operators of farms with fewer than 40 acres of cropland to be older than average (54 percent were over 50 years) but the age distribution of the operators of all the small farms was very similar to the age distribution of a sample of 3400 farmers in the same sections of Wisconsin for which similar information was available in 1942.

Age	Percent of small farm operators 20 to 59 crop acres	Percent of all farm operators average 62 crop acres
Under 30	9	9
30 to 39	19	21
40 to 49	24	25
50 to 59	24	25
60 and over	24	20

Six of the families interviewed were incomplete—one mate had died, the operator had never married or a divorce had been obtained. While no comparable data are readily available, this small number—5 percent of the total—suggests that small farms are not primarily a haven for broken or incomplete farm families.

The average size of family at home on the farms studied was 3.1. This is somewhat lower than the state average for rural farms in 1940 which was 4.0 persons. It seems probable, however, that with the wartime drain of people off farms the state average in 1945 would be substantially lower. The following tabular data indicate the percentage of families with specified numbers of living children regardless of whether they were living at home or not. No directly comparable data for all farm families in a midwest community are at hand but there does not appear to be anything abnormal about the variation in number of children per family on these farms.

	Number	Percent
Families without children	51	20
Families with one child	53	21
Families with 2 children	53	21
Families with 3 children	35	13
Families with 4 children	25	10
Families with over 4 children	40	15

Financial Situation on Small Farms

The debt situation of the families on these farms was improved by the high wartime incomes. Only 15 percent of these small farms were operated by tenants (half of whom were related to the landlord) and of the owners 70 percent acquired their farms before 1940. Of those who acquired their farms before this date 42 percent had real estate mortgages in 1944. Their average real estate debt was \$2374. Seventy-six farmers (30 percent of the farm owners) bought their farms in 1940 or later, 61 percent of whom were in debt at the time of the interview. Their average real estate debt was \$3257 and they had an average total debt of \$3434. Twenty-four percent of the tenants reported debts averaging \$1003 per farm.

Questions regarding savings and investments other than in the farm and household goods were not sufficiently specific to permit a statistical summary of the replies. A small percentage of the families had modest investments in war bonds, other real estate and similar property. For the most part, however, the entire savings of the family are represented by the equity in the farm and household property.

Occupational Experience and Plans of Small Farmers

The evidence suggests that most of the families on small farms in the better farming areas of Wisconsin are well adjusted to their environment and find this life most satisfactory to them in view of the alternatives society now has available. Most of the families interviewed on these small farms had previous experience either operating larger farms or working at nonfarm occupations. The figures are as follows:

	Farms 20 to 49 crop acres	Farms 40 to 59 crop acres
Operators with previous experience on larger farms	60	48
Operators with previous nonfarm experience	73	81
Operators with neither experience	26	45
Total operators reporting occupational experience ¹³	133	165

¹³ The sum of operators with different experiences is greater than the total num-

As pointed out earlier, approximately 85 percent of these families owned the farms they were operating. Thirty-six percent of these farm owners were sons or sons-in-law of the former owners of the farms.¹³ In other words, family ties and inheritance of the property have been controlling factors in less than half of the cases. This is in contrast to the tenants where over half were related to their landlords.

When asked if they planned to expand their farming operations or shift to another occupation in the near future almost all replied in the negative. Fewer than 15 percent of the operators (the younger men) expressed a desire to operate a larger farm. An equal number (of the older men) reported plans to retire from farming within the next 5 years. The remaining 70 percent of the group plan to continue indefinitely on about their present basis.

Summary and Appraisal

Several facts with important policy implications have been brought to light by this study. Families on small farms in the better farming areas of Wisconsin as a whole are satisfied with their place in society. Many of them emphasize the security and independence found on the small farm in this uncertain world. The evidence is not conclusive but they do not appear to be cropping their land more heavily than the operators of larger farms; the children are receiving as much as or more education than most rural children; housing does not appear to be any more of a problem than on the larger farms, and although these families are below average in their financial contribution to community enterprises, they are a functioning part of them. Most of these operators either lack the desire or the capacity to fill other positions in society where they might earn higher rewards.

When the problem of the small farm is approached from the standpoint of the people rather than the efficient use of man labor and machinery, one finds that these small units are performing a real service to Wisconsin people. The availability of these small acreages equipped with sets of farm buildings give families which

ber reporting occupational experience because some had both experience on larger farms and at nonfarm occupations.

¹³ This appears to be somewhat lower than could be expected for larger farms although only fragmentary data are available. See Parsons and Waples, *Keeping the Farm in the Family*, Wisconsin Agr. Exp. Sta. Res. Bul. 157, 1945, footnote 14, p. 20.

prefer the independence and the freedom from worry associated with a small farming enterprise an alternative which they would not have otherwise. Education and other governmental action might better be directed toward increasing the capacity and efficiency of present and prospective small farm operators rather than facilitating the consolidation of small farms. These units permit many families to enjoy a modest standard of living under conditions which suit them better than elsewhere in society. It is questionable whether or not families having these desires and abilities are decreasing as rapidly as are the small farming units.

Unless new developments enter the picture it would appear that we can expect sufficient competition from families wanting small farms to maintain enough units with less than 60 acres of cropland to account for at least 25 percent of the full-time farms in the better farming areas of Wisconsin. The operators of these farms will continue to be below average in efficiency of production of crops and livestock and will obtain relatively low family incomes. Educational programs directed more definitely toward their problems appear to be the most feasible and generally acceptable attack on this problem. The interviewers found a number of farm families who were carrying on soil management and livestock programs equal to those found on the most progressive farms in the State. With artificial insemination for dairy cows available in many communities, with well-bred baby chicks generally available and harvesting machinery for hire in most communities, the disadvantages of small farms are fewer than in earlier years. As more labor saving machinery for small units becomes available, their position will be further improved. If the operators of these small farms would adopt the crop and livestock management practices followed by the most progressive farmers in the state, they could increase their production and family income by at least 20 to 35 percent.

Leading agriculturalists differ in their opinions regarding the possible role of supervised credit for these small farm operators. Some point out that the demand for income for family living is so great in relation to total income that these families are not a satisfactory credit risk. Others point out that because of the family living requirements, if these families are to make financial progress they must borrow additional funds. Probably the most promising possibility in periods when prices are more nearly normal is the

use of supervised credit to assist families on these small units who wish to shift to larger farms.

In most cases the families on these smaller farms did not appear to be working as hard as families on the larger farms, but many cases were encountered where the man and his wife both worked long hours throughout most of the year. Continued progress in low cost labor saving machinery for small farming units is needed in order that these people may participate as fully as possible in the reduction of hard physical labor required in earning a living in modern society.

LONG-TIME ADJUSTMENTS IN FORAGE LAND UTILIZATION IN THE NORTHEAST REGION

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THE agriculture of the Northeast Region¹ has gone through a process of continuous adjustment to changing economic conditions for well over 300 years. Further changes are inevitable. Among these is the long-time adjustment in forage land utilization to increase the dependence on high quality roughage as a source of livestock feed. With dairying as the major farm enterprise production and utilization of roughage are of strategic importance in the agricultural economy. The further intensification of roughage production fits in with the physical adaptabilities and the economic organization of the agriculture of the Northeast.

The thesis of this paper is that roughage producing lands in the Northeast are under-utilized. Although many dairy farms are being operated effectively and efficiently, a much smaller acreage could furnish the necessary quantities of forage for a larger milk production in the region if the lands were managed scientifically. The purpose of this report is to analyze from the standpoint of land requirements the direction and the nature of the adjustments that appear imminent, rather than to determine the most desirable level of production for the region.²

The first task is a portrayal of the nature of the problems in forage land utilization. A brief review of recent data on acreages and livestock numbers may provide background as to the general setting in which these problems occur in the Northeast.

¹ Comprised of the six New England States, three Middle Atlantic States, Delaware and Maryland.

² Data for this analysis were obtained from Experiment Station, Extension Service and Department of Agriculture reports. In addition, the procedure included numerous discussions with specialists in several fields. Conclusions were drawn from both sources. It is known that there are differences of opinion on many issues, that others may come to different conclusions from the same facts, and that further research is essential to the development of adjustment programs. Nonetheless, a treatment in this fashion may assist in the further understanding of problems and aid the evolution of spheres of agreement in thought as to their scope, nature, and incidence.

Additional techniques and analyses are essential, especially on the relationship of the land economy of the Northeast to that of other regions and of the United States. The discussion has necessarily been confined to adjustments within the region leaving to another paper the task of showing the larger scope of the impacts of adjustments among regions.

Nearly two-thirds of the lands in farms in 1939 were used for the production of livestock feed. Even if the woodlands pastured are considered as woods rather than as pasture, the acreage utilized to produce feed for livestock exceeded 55 percent of the area of all land in farms. Harvested roughage amounted to 46 per cent of total cropland and to more than half of the acreage of cropland harvested. In terms of area, roughage production was the principal use of farm land.

The lands devoted to production of various kinds of livestock feeds did not contribute proportionately to total livestock feed grown in the region. As may be expected, pasture was a much larger part of acreage than of feed production, largely because the other pasture and woodland pasture produce relatively little feed per acre. Hay, silage, and grains constituted a greater proportion of total feed grown than of acreage utilized for feed production.

In 1939 there were in the Northeast about 5 million roughage-consuming animal units (cattle, horses and mules, sheep, and swine), and over 34 million acres of land were producing feed for livestock, an average of about 6.8 acres per roughage-consuming animal unit. Lands devoted to roughage production—all hay, silages, and pasture—amounted to roughly 6 acres per roughage-consuming animal unit. Since cattle constituted 85 percent, and milk cows alone constituted 60 to 65 percent of all roughage-consuming animal units in the immediate pre-war era, the discussion is largely confined to the problem of producing feed for milk cows.

Problem Situations in Forage Land Utilization

The ultimate concern in an analysis of resource utilization is the production resulting from the resources and the comparison of production under present conditions with possibilities under optimum conditions of resource combination. Inasmuch as the common denominator of roughage production is quantity of animal products, and milk is the major product in the Northeast, the problem situation in forage land utilization involves: (1) land treatment and management—the set of problems dealing with the growing of the roughage; (2) roughage harvesting and storing—the handling of the feed once it is grown; and (3) the problems of effective feeding, as related to animal care and management. Strictly speaking, roughage land utilization as such would not include harvesting and animal feeding, but these are so intricately

related to actual growing of the feed, especially from the viewpoint of land requirements and adjustments in land utilization, that they cannot be separated from the problem situation as a whole.

Land treatment and management. Within the range imposed by dictates of weather, the problem in producing roughage is primarily that of land care and fertility maintenance. The case is the same whether the roughage is pasture, hay, silage, or root crops. The operator is confronted with the ever-present questions of what practices to follow and what combinations of inputs of various factors to employ. The selection of the species and the variety of plants in the pasture or hay mixture is essentially a problem of land management.

Permanent pastures tend to run mainly to bluegrass and usually furnish good grazing during only a portion of the grazing season. Timothy-clover is the predominant hay mixture, and the greater part of it is timothy. In too many instances, selection of species and variety have not been associated directly enough with land type. There has been a tendency to treat fields as a whole, rather than to handle the farm by soil types and use the best adapted plants for each type. The selection of the seed mixture is further complicated by the necessity of getting a succession of growth in pastures and an even maturity in hay mixtures. The fact that pasture is a crop the same as is corn or potatoes and that the land must be treated scientifically to obtain production is beginning to be appreciated.

Although there is a unanimity of opinion that the first problem is one of fertility restoration and maintenance, there is much difference of opinion on the means of restoring and maintaining the fertility for high production. The whole problem situation of land management in forage land utilization involves the making of decisions as to the length of rotation, kinds of crops to be grown, selection of the specific variety, rates of fertilizer and lime application, kinds and amounts of cultivation. Data are available in many Experiment Station and Department of Agriculture publications on these and other related phases, even to the detail of recommendations for particular areas and particular soil types, but much remains to be accomplished in evaluating the combination of practices and figuring out the highest profit combinations. The making of these decisions depends on a host of other considera-

tions, including not only the harvesting, storing, and feeding problems, but also those regarding marketing of product and alternative uses for the land resources.

Forage harvesting, curing and storing. Seemingly greater progress has been made in increasing the production of hay per acre than has been made in the means of curing and storing. Only within the last few years have improved machines appeared on the market, and those such as field choppers and portable balers have not been generally available during the war years. Throughout the region the occurrence or lack of two or three days of good curing weather may be the difference between high and low quality hay.

By and large, the practices followed in the harvesting and storing of hay differ little from those followed just after the mowing machine came into use many years ago. The difficulties of harvesting and storing sufficient quantities of quality hay account in part for the use of corn silage. Except on the above-average farm, storage facilities are generally inadequate. The long winter feeding season and the amount of rainfall necessitate a system of protecting feed from the weather. Buildings are old and in need of repair. In many cases herd size has been increased without proportionate increases in forage storage space. The problem of how to cure and store adequate quantities of high quality roughage accounts in part for the heavy purchases of grain as a source of feed. Mow drying of hay, now in the experimental stage, may be an essential part of haying on the dairy farm of the future.

Increasing the amounts of harvested roughage utilized per farm will increase the need for storage space. Means will also have to be found for decreasing the labor requirements for hay curing and hauling, silo filling, filling the mow, and moving the feed to the cows during the feeding period. The providing of storage facilities raises many questions concerning structures and kind of facilities needed. The long-time custom of storing the hay in a mow may need to be examined carefully, particularly as to the economy in building cost and in labor requirements necessary to put the hay into and remove it from various kinds of structures.

Effective feeding. In too many instances the feeding of dairy cattle seems to be based more upon the amounts of roughage available on the farm than upon the feed requirements of the herd. In such cases the roughage supply is distributed through the feed-

ing season on the basis of amounts available, rather than by calculating the feed requirements in advance and utilizing the land resources to produce the optimum amounts of the cheapest and most effective kinds of feed. In other instances habit and custom have established the ration fixedly. Relatively too much emphasis has been put on the feeding of grain. The successful dairy enterprises—those that return a reasonable profit in most years—have demonstrated the economy of dependence on hay and pasture as principal sources of nutrients.

Calculating the herd ration is a complicated job, depending upon and affected by many factors outside the control of the operator. The decision alone of amount of grain to feed per cow is influenced not only by how much the individual may have of home-grown grains and roughages but is also influenced by the costs of concentrates and the relation between price of concentrates and the sales price of milk. Revision of the feeding program may mean the revision of the cropping system. These several types of changes will need to be made together. Greater use of pasture throughout the season, higher yields of pasture and hay per acre, and more effective harvesting and storing of roughage are essential adjustments in cow feeding. Unfortunately not enough attention has been devoted to how these particular phases affect each other.

Economic Aspects of Forage Land Utilization

The above situations together constitute the economic problem of under-utilization of resources. This results in inefficiencies, wasted effort, and in higher costs for both production and consumption. A few examples of the scope of the adjustments that might be made in forage land utilization will help to demonstrate the economic significance of the benefits and cost of change. One means of approach is to estimate the land requirements for forage production at some future date.

A comparative picture of land requirements for roughage production in 1950 and 1960 is shown in Table 1, along with acreage and production data from the 1940 Census and from Bureau of Agricultural Economics Reports. These data are estimates of requirements and are *not to be interpreted as forecasts of probable relationships*. They picture the desirable direction of adjustment,

TABLE 1. MILK PRODUCTION AND CONSUMPTION AS RELATED TO FORAGE LAND REQUIREMENTS, NORTHEAST REGION

Item	Unit	1940 data from Census and BAE reports	1950, with moderate cost good diet and production for fluid market	1960, with adequate diet level, and production for fluid market
Population in region	Thousands	38,065	41,576 ¹	43,800 ¹
Per capita consumption, all dairy products	Pounds	826	1,066 ²	—
Fluid milk and cream	"	345	560 ²	645 ²
Milk consumption—total	Million #	31,441	44,320	—
As fluid milk and cream	"	13,147 ⁴	23,282 ⁴	28,251 ⁴
As other dairy products	"	18,294 ⁴	21,038 ⁴	—
Production per cow	Pounds	5,560	6,000	8,000
Milk production in region— total on farms	Million #	18,427	25,726	28,816
Fed to calves	"	490	676 ⁵	565 ⁵
Used for food	"	17,937	25,050 ⁵	28,251 ⁵
Number milk cows—(average during year)	Thousands	3,314	4,288 ⁷	3,602 ⁷
Number of other cattle	"	1,576	2,309 ⁸	1,940 ⁹
Total number all cattle	"	4,890	6,597	5,542
Number animal units, all cattle	"	4,496	6,019	5,057
Acreage requirement—rough- age producing lands	"	17,991 ¹⁰	12,864 ¹¹	10,806 ¹¹
For milk cows	"	7,496 ¹⁰	5,193 ¹¹	4,365 ¹¹
For other cattle	"	25,487 ¹⁰	18,057 ¹¹	15,171 ¹¹
All cattle	"	25,487 ¹⁰	18,057 ¹¹	15,171 ¹¹
Total acreage—for roughage- consuming stock		29,985	21,243 ¹²	16,856 ¹²

¹ Based on *Estimates of Future Population of the United States, 1940-2000*, National Resources Planning Board, August 1943. United States total 143,896,000 for 1950 and 151,646,000 for 1960. Northeast same percent of totals as in 1940 (28.9 percent).

² "Food and Life," *Yearbook of Agriculture*, 1939, p. 329. Equivalents of 260 quarts of milk and 25 pounds of butter. Per capita consumption assumed to be same in Northeast as in the United States.

³ Unpublished data, Bureau of Agri. Economics. Minimum food requirements at the good adequate level: fluid whole milk and equivalent quantities of evaporated or dried milk or cheese; does not include milk from which only cream or butterfat is used for human consumption.

⁴ Calculated: multiplying per capita consumption by population.

and in that sense may be helpful in the development of adjustment programs.

For the Northeast as a whole in 1940, 5.4 acres of land per milk cow were utilized in roughage production. Even if the total of woods pastured is excluded from the roughage lands, over 4.4 acres per cow were utilized in roughage production. On the basis of reliable estimates, an average of 3 acres per cow (and per animal unit) will produce needed amounts of roughage under proper management practices. Thus, in the next 5 to 15 years it may be possible to transfer several million acres of forage-producing land to other uses and to increase milk production at the same time.

How much of the possible decrease in acreage of roughage-producing land and the increase in milk production depicted in Table 1 can be made economically? Probably acreage will not be reduced by that amount, and milk production will not increase that much. But a significant portion of each would be economically feasible. The calculated levels of production and consumption are considerably above present levels, and the wartime consumption is above that of the prewar years. If per capita incomes drop, both production and consumption are likely to drop. Furthermore, it is reasonable to expect that there will be increasing interregional competition in milk production, particularly in the longtime period.

Interregional competition in milk and milk products will be decided on the basis of the comparative advantage in production and the possibilities of alternative employment opportunities for present and prospective workers. The South and portions of the Middle West will undoubtedly increase the production of milk, first to meet local needs, and second as a part of the long-time adjustment from cotton and corn-hog farming. A portion of this in-

⁵ Assumed: 1950 same proportion of amount used for food as in 1940; 1960 assumed at 2 percent of amount used for food.

⁶ In 1950, calculated higher than figure on consumption fluid and cream, to allow for seasonal variation in production; in 1960, same as consumption fluid milk and cream—see ³.

⁷ Milk production in region, divided by production per cow.

⁸ Same relationship to milk cow numbers as in 1940.

⁹ Estimated.

¹⁰ At 60 percent of acreage all roughage-producing lands—for milk cows; 25 percent for other cattle.

¹¹ At 3 acres per animal unit.

¹² Assuming acreage for all cattle is 85 percent of acreage for all roughage-consuming livestock in 1950, and 90 percent in 1960.

creased production might reach some of the markets in the Northeast, particularly if significant changes take place in technology of transport and if interstate trade barriers are relaxed. How much of this is done in the long-time future will depend in large part upon the nature of the policy of production adjustment and in the kinds of programs that are adopted to guide adjustment.

The adjustment in acreage of land devoted to roughage production in the Northeast will be a function of many variables. It is not only the question of how much feed may be grown economically on each acre of roughage-producing land but also what are the alternative use possibilities and the alternative income-earning opportunities for the lands now devoted to roughage production and for the land owners. These are inextricably a part of intra-regional and interregional competition. It is reasonable to assume that the producers of the region will continue to supply the fluid milk needs, and in spite of changes in food habits—such as the substitution of other forms of dairy products for fluid milk—the total fluid market can expand because of population increase and greater consumption per capita.³

One means of indicating the desirability of adjustments in the acreage of land devoted to roughage production in the Northeast is to examine the relative costs of nutrients from various sources. This will not show the level of production per acre that is economically feasible but will emphasize the necessity of greater dependence on roughage, especially pasture, as a source of nutrients.

At 1939 prices, the costs of producing 100 pounds of total digestible nutrients on cost account farms in New York State were as follows:⁴

Oats	\$2.32	Corn silage	\$1.16
Barley	1.88	Alfalfa	1.04
Wheat	1.34	Other hay	1.26
Corn grain	1.92	Permanent pasture	0.40

³ For further discussion, see Woodworth, Smith, and Rauchenstein, *The Agricultural Conservation Program in New Hampshire*, Station Bulletin 314, University of New Hampshire, June 1939, especially pages 24-32.

⁴ Source: *Cost of Producing Feed Crops*, AE-339, Mimeo. New York State College of Agriculture, Department of Agricultural Economics and Farm Management, May 1941. The costs on harvested crops are calculated from cost account records. Cost of pasture is estimated on the basis of 600 pounds TDN per acre, and cost of maintaining an acre of permanent pasture and fence was \$2.42. Cost of rotated pasture was \$5.32 per acre, but no estimate of yield was given.

Similar figures from other sources vary in detail but conform to the same general pattern. Pasture is the cheapest source of feed and concentrates are the most expensive. The variation in costs or estimates of costs is to be accounted for by variations in yields and by variations in the accounting methods used in calculating the costs. Unfortunately the data on costs of pasture are subject to greater error than are the costs of nutrients from other sources, for there is no accurate measure of the yield of pasture. Although pasture is the cheapest source of nutrients, only part of the feed needs can be supplied by pasture because of the long winter feeding period.

The evidences on costs of nutrients from various sources can be applied generally only to indicate that the direction of adjustment is toward greater dependence on roughage. If the practices are changed, then the cost relationships will likewise change. The cost of nutrients from forage may increase per unit, and costs of concentrates may decrease; but the new combination may be at lower total cost and nearer to the highest profit combination. Careful budget analyses of alternatives can help the individual operator, but in addition, public policy may well assist by encouraging adjustment on an areal basis, making best use of the total resources. On specialized and so-called "factory" farms that buy most of their feeds, dependence will probably continue to rest on high feeding of concentrates. But on the majority of farms, especially where land values are in line with agricultural production possibilities and are not influenced unduly by competition with other land uses, increased dependence on forage will be economically feasible.

Another indication of the direction of adjustment is given in the three following figures on estimated yields of hay.⁵ The significance

⁵ The author is indebted to several individuals at the Bureau of Plant Industry Experiment Station, Beltsville, Maryland, for the basic data and copies of the base map of soil associations from which these figures were made; appreciation is expressed particularly to Messrs. C. E. Kellog; J. K. Ableiter; E. A. Hollowell; O. S. Aamodt; W. J. Latimer; W. H. Lyford; and C. P. Barnes. The estimates of yield, present and prospective, were made by a number of individuals, each knowing the characteristics of soil and climate for portions of or an entire State. Estimates were made by soil types within soil associations. In preparing these regional maps, the estimated yield for the soil association was calculated by weighting the estimated yields of the soil types by percentage of area of the association of which each type is a part. Yields by associations were then arranged in class intervals. In like manner, figure 4 was prepared by weighting the estimates of portion of each soil type used

of these figures is in the relative, rather than in the absolute comparison. The estimates were made on the basis of land in crops or pasture; they *are not to be interpreted* to mean that these estimated yields may be expected on all lands in the individual association.

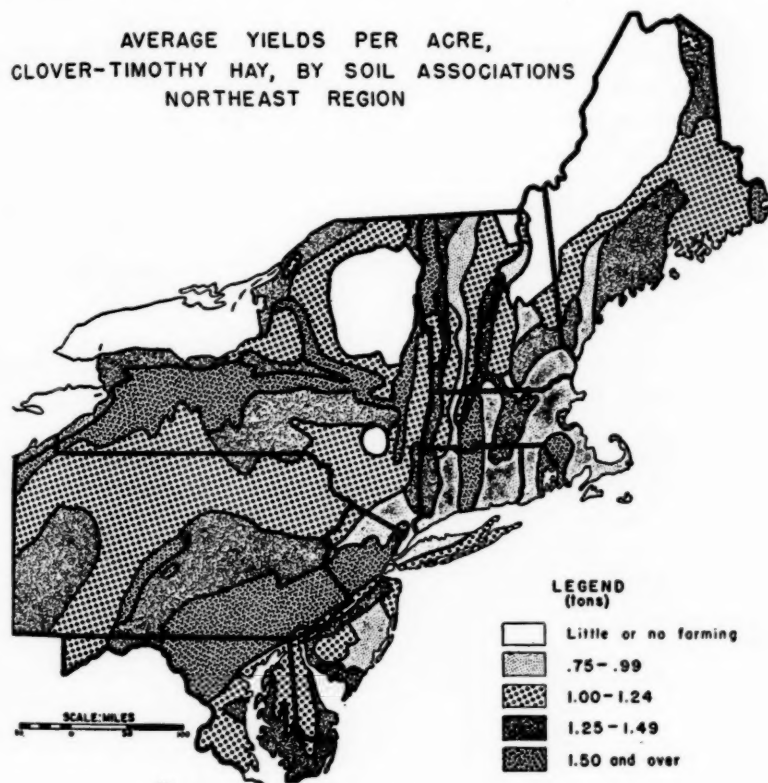


FIG. 1

Instead, the estimates imply that an average yield of the indicated amount may be expected from lands already in crops or pasture. Figure 4, showing percentage of land area in crops or pasture, is included as a further basis of comparing Figures 1, 2, and 3.

for cropland or pasture by the percentage the type is of area of the association and grouping the resulting association percentages into class intervals. Responsibility for this organization and presentation rests with the author.

The differences between the estimated present yields of clover-timothy hay and the yields of best adapted hay combination under best practices amount to a doubling of yields in some areas. In others, yields may be increased by one-half, three-fourths, or one ton per acre, if proper land management practices are followed.

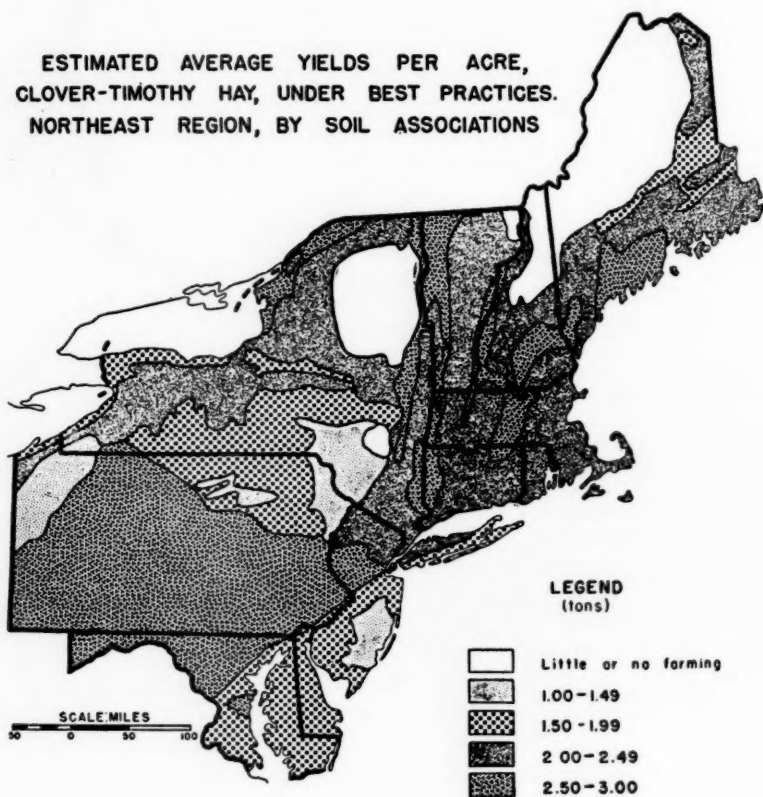


FIG. 2

The difference between present and possible yields on individual soil types and on individual farms, as a result of scientific practices, could be even higher. More realistically, however, such increases in yields over large areas are beyond the realm of reasonable expectation in view of history of inertia to change. An increase of a half-ton per acre in average yield of hay would be a tremendous accomplishment for a 5-year period. A doubling of the carrying

capacity of pasture would be easier to obtain than a like increase in yield of hay because of the generally poorer status of pasture management.

The two principles of economics involved in figuring out the most feasible level of production of forage per acre and per farm

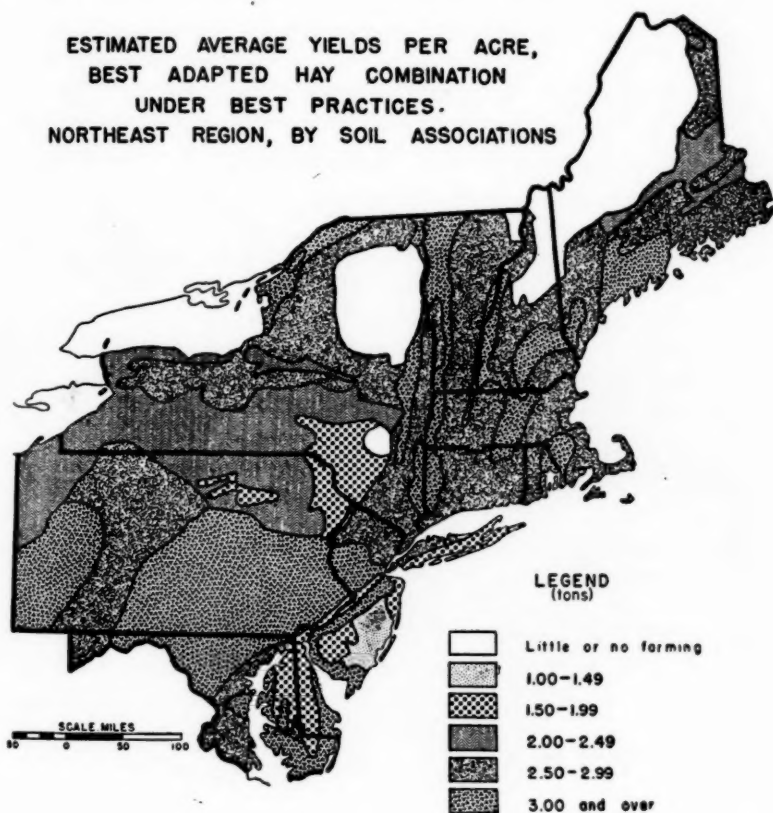


FIG. 3

are (1) diminishing returns—the comparison of costs and returns at various levels of intensity; and (2) opportunity cost—the comparison of costs and returns from forage with costs and returns from other uses of land. These principles raise the two questions of when to use another acre of land instead of putting the additional input of capital on the limited area, and when to shift to some other use

for part or all of the acreage. Although some general statements may be made as to the direction of adjustment for the region as a whole, and for particular parts of the region, the specific calculation for the individual operating unit can be made only when the facts in the individual situation are known.

No estimates are made here as to how much additional capital

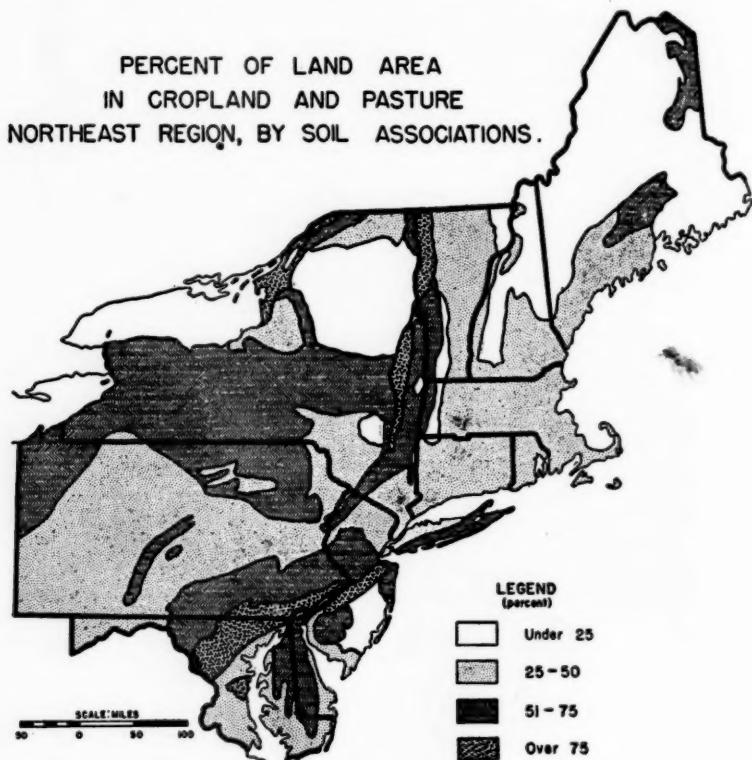


FIG. 4

investment in the form of lime, fertilizer, machinery, cows, buildings, and labor would be needed to make the feasible adjustments in forage land utilization in the Northeast. It is easy to see that the total costs of adjustments would be high, but the benefits would be many. The costs of *not making adjustments* would also have to be considered. The lack of adjustment can mean more farm aban-

donment, continued low levels of family income, and increased under-utilization of both human and natural resources. If maladjustments in the use of the land resources of the region continue, further compensatory adjustments in the pricing system may be demanded; for example, the resort to greater public subsidies. The alternative might be that more producers in the region will lose out on some of the economic advantages now enjoyed.

The chief economic advantage accruing to producers in the Northeast has been that resulting from location with respect to market outlets. The region contains nearly 30 percent of the Nation's population. The population demands a fluid milk supply. The price offered and paid for milk for fluid consumption has been consistently higher than that for milk in other large producing areas. The production for the fluid market has thus given producers of the region a price advantage. Price policy will have many effects on the future of land utilization in the Northeast.⁶ The price policy cannot follow with impunity the pattern of being maintained at arbitrary high levels, using control over supply areas through health and inspection regulations.

Significance of Adjustments in Forage Land Utilization to the Land Economy

The estimates of land requirements for milk cows, and in proportion, the estimates of requirements for all roughage-consuming animal units denote that several million acres eventually will not be needed—if desirable adjustments are made (Table 1). When and as the production per acre increases, from 8 to 13 million acres of land now used for pasture and harvested roughage may be shifted to other uses. The estimates of potential milk requirements are undoubtedly high but may compensate for the probable lack of adjustment in production per acre.

In the next 20 years, even with increasing population and increased consumption per capita, the number of milk cows in the Northeast is not likely to exceed 4 millions. The rate of population increase is beginning to decline. The increase in consumption of

⁶ For further discussions, see "Contributions of Price Policy to the Income and Resource Problems in Agriculture," by D. Gale Johnson, this JOURNAL, November 1944; also "Some Aspects of Administrative Pricing As Related to Land Economics Research," by V. L. Hurlburt, *Journal of Land and Public Utility Economics*, May 1944.

dairy products may be in manufactured products more than in fluid milk, in which case a larger part of all dairy products may come from other producing areas. If the producers of the Northeast meet the fluid milk needs of the region, and if the needs for other dairy products are met from in-shipments, increasing production per cow may take care of the increasing consumption per capita. If numbers of milk cows do not exceed 4 millions and other livestock remain in about the same relative numbers as during the past few years (except for a decline in numbers of horses and mules), the total land requirements for roughage production should not be more than 20 million acres. Nearly 10 million acres, including the 5.6 million acres of woods pastured, would be available for other uses.

Much of the land shifted out of roughage production will undoubtedly go into forestry. The woods pasture will need treatment, including re-stocking, selective cutting and other forestry practices, but the main need is to stop the grazing of livestock. Some of the nonplowable lands now pastured also will likely go into forestry; these will require more developmental work, and special attention will have to be given to such related aspects as taxation of these lands so that forestry will return an income sufficient to keep them in that use. There will be many intershifts within the lands remaining in roughage production. Some of the lands now used for pasture can be shifted to hay, some used for hay can be used for pasture, and some for other crops. The distinction between plowable pasture and hayland will tend to disappear, for the land will be used for both pasture and harvested roughage. Likewise, some of the lands now used mainly for other crop production may be shifted to hay or pasture if it can be demonstrated that the income from lands producing forage crops compares favorably with that from other crops. Intensification of forage production may make possible the growing of greater amounts of grain crops and thus decrease the dependence of producers on purchase of concentrates. The shifts in this respect will depend largely upon whether home production or purchase is the more economical.

No attempt is made here to give in detail the distribution between silage, hay, and pasture. The prospect is that corn silage will undoubtedly make up a smaller part of total nutrients. As yields of other roughage crops increase, the advantage of corn silage from a total yield standpoint will decrease, and the greater labor re-

quirement of corn silage may not compensate the smaller advantage in yield. Total pasture acreage will likely decrease, but a considerably larger portion of the nutrients will come from pasture. Hay will undoubtedly remain the chief forage crop. The details of adjustment will have to be worked out on the individual farm, but not necessarily within the boundaries of existing farm units. Effective and efficient utilization of forage producing lands may require significant reorganization in pattern of operating units.

The process of adjustment in forage land utilization involves far more than just transferring nonplowable pasture to other use, fencing off the woodlot, and improving the lands remaining in forage production. The manner in which lands of various qualities are distributed among operating units will necessitate that thousands of acres of none-too-good pasture and hayland will continue to be used because that farm as an operating unit is dependent on that land. Furthermore, the advantages of location with respect to market may compensate in lower marketing costs the advantage that higher producing land may have in yield, which only emphasizes that transportation differentials will have to be calculated carefully in future price-setting determinations if price policy is to be used to guide the distribution of production.

The immediate effect of adjustments on patterns of land use and occupancy will be slight. Changes will take place largely within farms, with each making changes which affect neither the type of agriculture nor the density or distribution of population. In the longer run adjustments will be made in numbers and sizes of farms. The upward trend in size of herd will undoubtedly continue, and if total cow numbers remain at approximately present levels, there will be fewer farms. Part of the adjustment may be made through combination of units, adding the cropland to an adjacent farm unit. The pattern of occupancy may remain much the same, for many of the houses may be occupied as rural residences. Also, more of the smaller farms, especially those located in areas of declining agriculture, probably will be changed to summer homes and recreational occupancy.⁷

The adjustments in forage production and utilization must be a slow-moving, long-time process. Although the individual may initi-

⁷ For an appraisal of this process, see John C. Blum, *Summer Homes and the Rural Economy*, University of New Hampshire, Agricultural Experiment Station Bulletin No. 344, October 1942.

ate a number of practices and make significant changes in any one year, it may take 5 or 10 years for the farm as a whole to be established as an efficient operating unit in which optimum use is made of roughage. The adjustment for the individual cannot be limited to increasing the yields per acre of hay or pasture. If use of roughage in the system of farm operation is maximized, the individual may need to carry further a livestock breeding program so that the dairy herd will have the capacity to make good use of larger quantities of high quality roughage. Higher yields, aside from enabling significant changes in the cropping system on the farm, may make possible an increase in the numbers of livestock carried and thus necessitate a building program providing barn room for cattle and storage space for roughage. In view of the increasing competition among producers within the region and with producers in other regions, the types of adjustments indicated here are practical requirements for thousands of dairy farms to continue in the long-run as going concerns.

There are numerous operating units scattered throughout the region on which few changes will likely be made in forage production and utilization under the present operators. These, by and large, are units operated by persons of retirement age. Many commercial farms of the past, because of advancing age of the operator, lack of heirs interested in taking over operation, the necessity of a place to live in retirement or semi-retirement, or other reasons, now contribute mainly a home and part of the family living. There is no feasible method of estimating the number of such instances, the acreages involved, or the longer-time possibilities of increased production that might result by operation at capacity. Likewise, thousands of part-time farms probably will be operated at less than capacity, for the occupant's chances of maintaining a satisfactory level of living may be greater in non-farm than in full-time farm employment. The types of adjustment and the possibilities of increased dependence on high quality roughage will, therefore, be of most significance on full-time commercial units.

How much a wide-scale improvement in utilization of forage lands can contribute to the feed shortage problems in years of drought remains to be seen. There is a general tendency for farms to be overstocked in relation to roughage supply. Especially in dry years, or years in which rainfall is lacking during part of the growing season, pastures and hay are inadequate. Part of the solution

involves the creation of greater reserves—the storage of roughage from year to year to meet the requirements in the short-yield season. If cattle numbers are not increased in direct proportion with increased forage production, many operators may carry over enough hay from a good year to tide over a year of drought. Land improvement, selection of species, and crop care can increase the yield even in dry years. The crop, whether pasture or harvested roughage, makes optimum use of available moisture, or makes a growth before the drought becomes acute. The farm with a well-rounded roughage program will have a number of forage crops, maturing at different times of the season, so that loss or partial loss of one will not upset the whole roughage supply.

Any significant adjustment in forage land utilization will shift both the intensive and the extensive margins of cultivation in the Northeast. Millions of acres of land at the extensive margin of cultivation may be taken out of production and shifted to non-agricultural or to other agricultural uses. Most of this would be lands on which the costs of improvement would be high and on which net returns have been low in the past. Second, the application of more effective practices and of new technology, particularly the greater application of fertilizers and more scientific land treatment, will shift the intensity of operation. Third, effective practices could make profitable the use of some of the lands of the poorer grades. The general tendency will be for all of the lands remaining in forage production to be farmed more intensively, and that fewer acres will be needed for forage production. The exact nature of that shift cannot be spelled out here, but will need to be worked out with due consideration to national, regional, and local situations.

Summary

Possible adjustments in forage land utilization far exceed the probable changes even though such changes are both feasible and desirable. The adjustments will involve changes in other phases of the agricultural economy if those in land utilization as such are to be effective. Likewise, changes in other phases of economy, whether local, regional, or national, and whether agricultural or non-agricultural, will influence the making of adjustments in forage land utilization. Serious consideration will need to be given to the problems involved in pricing, in marketing, and to the impacts of the separate adjustments upon each other. Nor can agricultural leaders

or individual producers afford to overlook the costs of not making necessary adjustments, any more than they can overlook the costs and the benefits of change.

The types of adjustments discussed in this paper may be summed up into the recommendation that public policy encourage the production of more and better roughage on a smaller total acreage. This should result in greater total returns through more milk per cow and per farm. The producers of the region would be less dependent on others for their feed supply and should be less vulnerable to the idiosyncrasies of prices changes in milk and in feeds. Some of these adjustments will undoubtedly take place regardless of the scope of the shifts that will likely occur in the agriculture of other regions. But if the problems associated with under-utilization of resources in the Northeast are to be solved effectively, the program of adjustment will need to be developed in conformity with those in other parts of the United States. Land improvement for roughage production in the Northeast poses fundamental problems in national agricultural policy.

INPUT-OUTPUT RELATIONSHIPS IN FATTENING CATTLE*

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Cattle fattening affects both the quantity and quality of the beef supply. By fattening thin cattle of desirable feeder grade, the weight of the animal is increased, the dressing percentage is increased, the quality is improved, and the food nutrient content of the carcass is increased. Moreover, the supply of beef can be distributed more evenly over the year, and rough feeds which have no higher alternative use can be turned into food. For cattle fattening to make the maximum contribution to the food supply, both when feed is scarce and when it is plentiful, and to enable public agencies and cattle feeders to appraise fully and accurately costs and returns with various conditions, information as to the relationships of food produced per unit of feed consumed is essential.

The purpose of this paper is (a) to set up and analyze input-output relationships throughout the fattening period of calves, yearlings, and 2-year-old feeders; (b) to point out significant relationships; and (c) to indicate the usefulness of this analysis in the development of necessary food programs, and as the foundation for an analysis of costs and returns relationships. A setting for this analysis and discussion as it pertains to the agricultural economy is indicated by a summary picture of the size and characteristics of the cattle fattening enterprise in the United States.

The Cattle Fattening Enterprise

Fattening cattle is an integral part of farming in the Corn Belt and in scattered areas in other parts of the United States. The particular characteristics, development, and organization of the factors of production of many farms in these areas result in a type of agriculture which includes cattle fattening as an integral part of a well-rounded and efficiently operated farm unit.

* The author, now employed by the Farm Credit Administration of Omaha, completed a comprehensive study of the cattle fattening enterprise while employed by the Bureau of Agricultural Economics which served as a basis for this article. The author gratefully acknowledges the assistance of specialists of state colleges, public stock yards, the United States Department of Agriculture, and other individuals familiar with cattle fattening who provided data and judgments which made this analysis possible. Special recognition is given C. W. Crickman, and R. D. Jennings, Bureau of Agricultural Economics.

During the period 1938-39 to 1942-43 (year beginning October 1) about 4 million head of cattle were fattened annually in the 11 Corn Belt and border states. Information available indicates that during the same period about 1 million head were fattened annually outside the Corn Belt area, making a United States total of around 5 million head, equivalent to about 30 percent of the cattle, excluding calves, slaughtered annually.

The annual *gain* in live weight on cattle fattened in the Corn Belt during the period 1938-39 to 1941-42 was about 1.5 billion pounds, the production of which required the equivalent of about 200 million bushels of corn and about 280,000 tons of protein supplement. Information available indicates that about 250 million pounds *gain* in liveweight were produced annually during this period on cattle fattened on farms outside the Corn Belt, making an annual United States total of about 1,750 million pounds *gain* in live weight produced by fattening cattle.

The annual *live weight* of slaughter during the period 1938-39 to 1941-42 was about 4 billion pounds for cattle fattened in the Corn Belt and about 1 billion pounds for cattle fattened outside the Corn Belt, making a total for the United States of about 5 billion pounds, or about one-third of the live weight of all cattle, excluding calves, slaughtered in the United States. The proportion of the beef supply, excluding veal, coming from grain-fattened animals was greater than one-third because of the higher dressing percentage of fattened animals.

Measures of Input and Output

The efficiency with which feed is utilized in the production of food and food constituents at various stages in the fattening period is indicated by an analysis of relationships in data on feed consumption, gain in live weight, slaughter grade, dressing percentage and body composition during the fattening period.

Kinds and sources of data used

A 3-year series of experiments conducted at the Iowa Agricultural Experiment Station in fattening Choice feeder steer calves, yearlings and 2-year-olds to Choice slaughter grade animals to find the relative economy in fattening the three ages of feeders; and to give information as to food consumption, gains, finish, yields and

character of the carcasses is the basis for the analysis.¹ The cattle were full-fed a standard Corn Belt fattening ration in dry lot. Reports on the experiments give complete data by monthly periods as to the quantity and quality of feed consumed, and gain in live weight, as well as the grade, dressing percentage and body composition for a small number of typical animals at the *beginning* and *end* of the fattening period. Congruent estimates, based upon data from other experiments or analysis were derived for dressing percent and body composition *during* the fattening period, with the cooperation of specialists in the Bureau of Animal Industry, U.S.D.A.² The estimated gain required by Choice feeder steers to make average Good slaughter animals was derived from experimental data supplemented by the judgment of animal husbandmen from the Corn Belt States.

Feed converted to total digestible nutrients

All feeds were converted to a total digestible nutrient basis to facilitate obtaining a total for feed input. Since the report of the experiments gave information on quality of the feed, as well as quantity, relatively accurate determination of the total digestible nutrient content of the feed input was possible, with the use of Morrison's conversion factors.³

The growth curve and slaughter grade

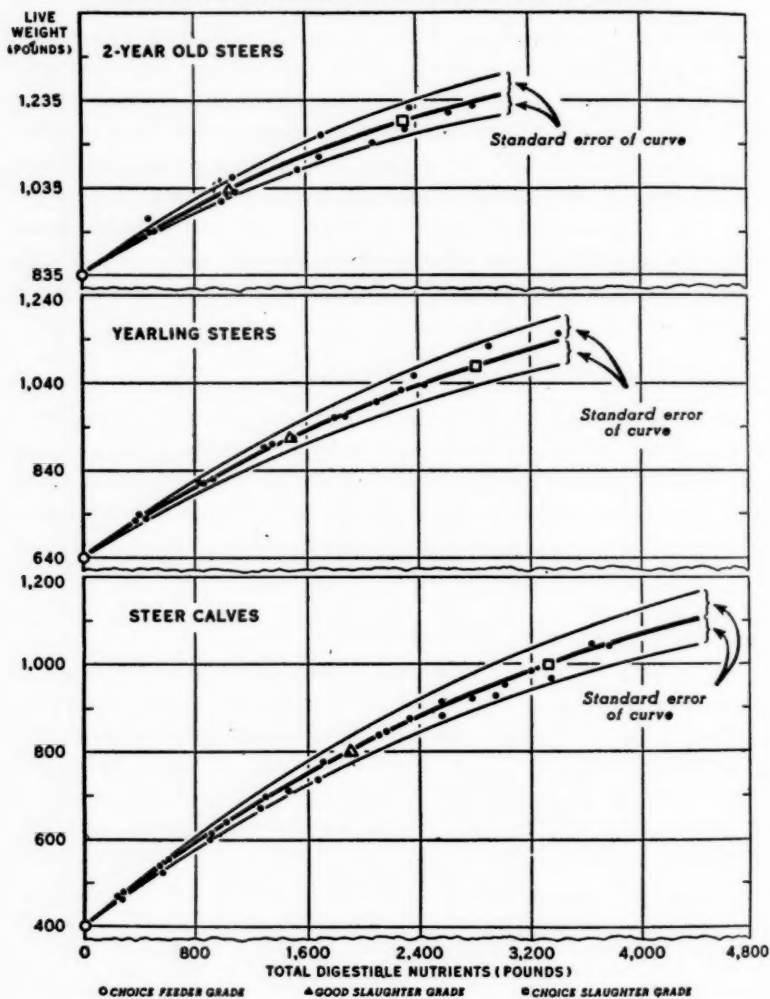
The growth curve and its standard error for Choice feeder steer calves, yearlings, and 2-year-olds reflecting the cumulative live weight output compared with cumulative feed input is presented graphically in Figure 1. Live weight is given on the *y* axis, and pounds of total digestible nutrients on the *x* axis. The dots represent averages for lots of cattle varying in number from 7 to 12 head, the modal number being 8. The equations for the growth curves, the method of fitting and of calculating the standard error, and a

¹ C. C. Culbertson, et al. *Relative Efficiency of Calves, Yearlings, and 2-year-old Steers for the Producer*. Iowa Agr. Expr. Sta. Bul. 271, 1930; and Helser, M. D., *Influence of the Animal's Age upon the Quality and Palatability of Beef*, Iowa Agr. Expr. Sta. Bul. 272, 1930.

² While these data are believed to be fairly congruent and accurate, the reader should be cognizant of their limitations. Experimental data are at best only approximations of true data and when judgment must be relied upon to adapt one set of experimental data to another, the probability of error is increased.

³ F. B. Morrison, *Feeds and Feeding*. 20th Edition. Morrison Publishing Co., 1937.

RELATION OF LIVE WEIGHT TO TOTAL QUANTITY OF FEED
CONSUMED THROUGHOUT THE FATTENING PERIOD



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FIG. 1

discussion of the meaning of the standard error, is given in an appendix to this article.

Contingent on error in the growth curve and susceptible to influences such as breed and feeding characteristics, the slaughter grade as related to feed consumption and gain in live weight can be indicated on the growth curve (Fig. 1). Choice feeder steer calves require about 400 pounds of gain in live weight to produce Good or A carcasses and an additional 200 pounds of gain to produce Choice or AA carcasses.⁴ Choice yearling feeder steers require about 270 pounds of gain to produce Good carcasses and an additional 170 pounds of gain to produce Choice carcasses. Choice 2-year-old feeder steers require about 200 pounds of gain to produce Good carcasses and an additional 150 pounds of gain to produce Choice carcasses. The younger feeder cattle gain more in live weight per unit of feed than the older feeder cattle; but they require more feed to attain comparable slaughter grades because they grow more during the fattening period.

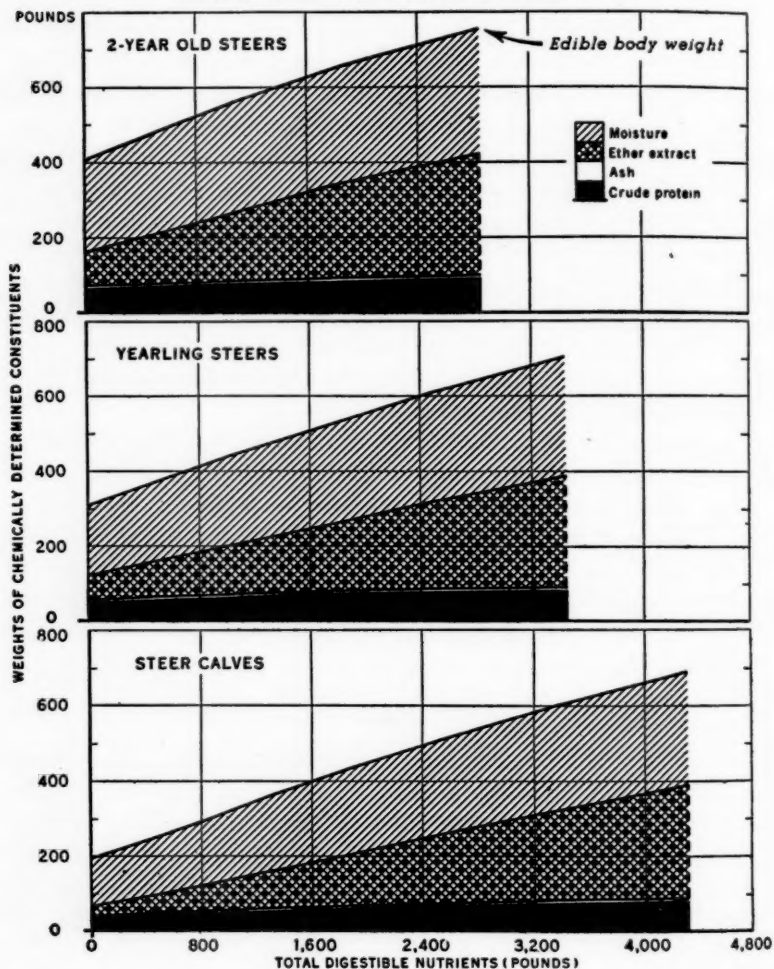
Calves require about 3,300 pounds of total digestible nutrients, yearlings about 2,840 pounds of total digestible nutrients, and 2-year-old steers about 2,335 pounds of total digestible nutrients for fattening from Choice feeder grade to Choice slaughter grade when fed a standard Corn Belt ration in dry lot. The increase in slaughter grade from Good to Choice requires 43.4 percent of the total feed for calves, 48.6 percent for yearlings, and 54.6 percent for 2-year-old steers.

Edible body weight and composition

As the animal grows and fattens the edible portion of the animal (edible carcass plus edible offal) increases relative to live weight. This increase is partially reflected by the change in dressing percentage. Only about half of the live weight is edible at the beginning of the fattening period and a large part of the gain in live weight during the fattening period is in the edible portion. Because of the greater growth in young animals, a smaller part of the increase in live weight in calves is edible compared with older feeders, but a larger part of the increase in the edible portion is protein.

⁴ In this article the degree of finish indicated by the grade names is that carried by the animal when it has reached the average or middle of the specified grade unless otherwise specified. To insure clarity at several places in the discussion, however, it seemed desirable to specify the specific degree of finish as the average of the grade.

RELATION OF WEIGHTS OF CHEMICALLY DETERMINED CONSTITUENTS
OF THE EDIBLE BODY TO TOTAL QUANTITY OF FEED CONSUMED
THROUGHOUT THE FATTENING PERIOD



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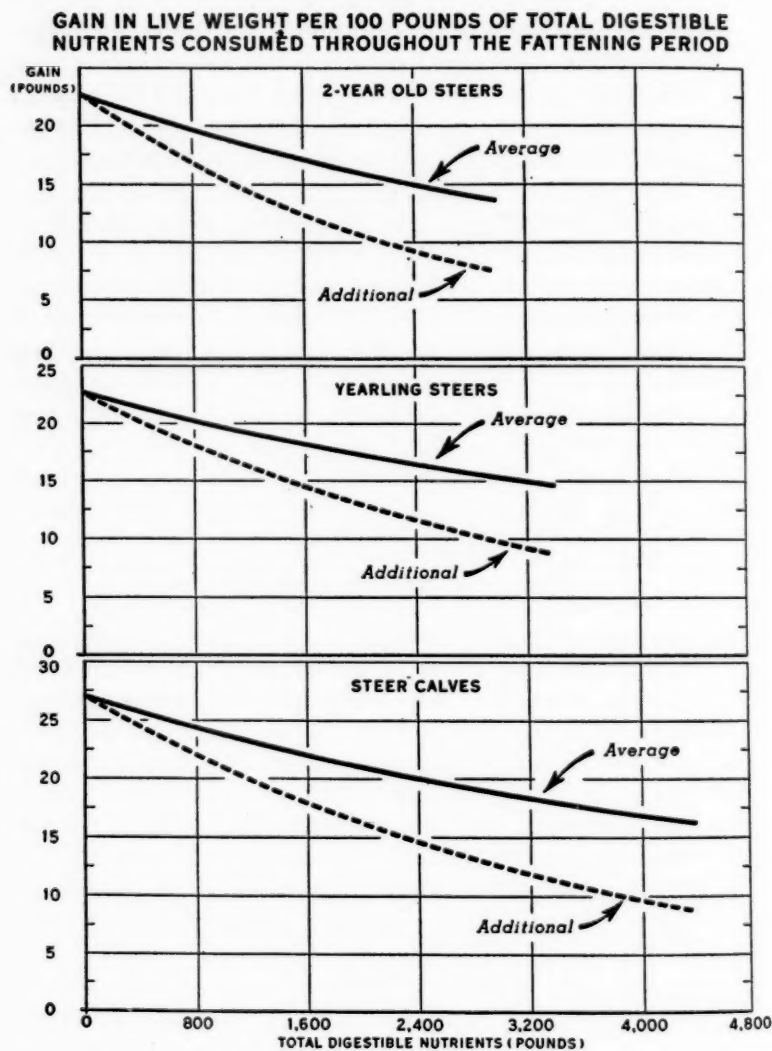
FIG. 2

The relative increase in the edible portion of the animal indicates only a part of the gain during the fattening period. A change also occurs in the composition of the edible body. The estimated weight of the chemically determined constituents—crude protein, ash, ether extract (fat), and water—of the edible body of Choice feeder calves, yearlings, and 2-year-old steers throughout the feeding period is shown in Figure 2. This chart illustrates the large proportion of the edible body that is water, particularly when the animal is in thin condition. The edible body of younger feeders has the highest percentage of water. About two-thirds of the edible body of Choice feeder calves is water at the beginning of the feeding period compared with about half at Choice slaughter grade. The water content of the edible body of a Choice 2-year-old feeder steer is about 60 percent, and is reduced to about 46 percent at Choice slaughter grade. The increase in fat is relatively greater than that of other constituents. The quantities that are protein and ash do not increase much during the fattening process, but the increase in these two nutrients is relatively greater for young than for older animals.

*Relationship Between Quantity of Feed Consumed
and Food Products Produced*

As indicated by the above discussion on measures of input and output, gain during the fattening period results from and is reflected by the increase in live weight, dressing percentage, and nutrient content of the animal body. None of these are adequate indicators of efficiency for all purposes and the curves indicating efficiency during the fattening period differ considerably depending upon which measure of gain is used. In the following analysis, therefore, two measures of efficiency are portrayed graphically and treated individually, followed by a comparison of other measures with these and a discussion of the interpretation, limitations, and significance of measures of efficiency.

Relationships which exist between the quantity of feed input and food output are depicted both by average and by additional output curves. As the animal is fattened pertinent relationships are portrayed both by the average quantity of food and food nutrients produced for all units of feed consumed and by the additional quantity of food and food nutrients produced for each successive unit of feed consumed. For emphasis, it might well be pointed out that considering only the quantitative aspects of input-output relation-



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FIG. 3

GAIN IN EDIBLE BODY NUTRIENTS (CRUDE PROTEIN, ASH, AND ETHER EXTRACT) PER 100 POUNDS OF TOTAL DIGESTIBLE NUTRIENTS CONSUMED THROUGHOUT THE FATTENING PERIOD

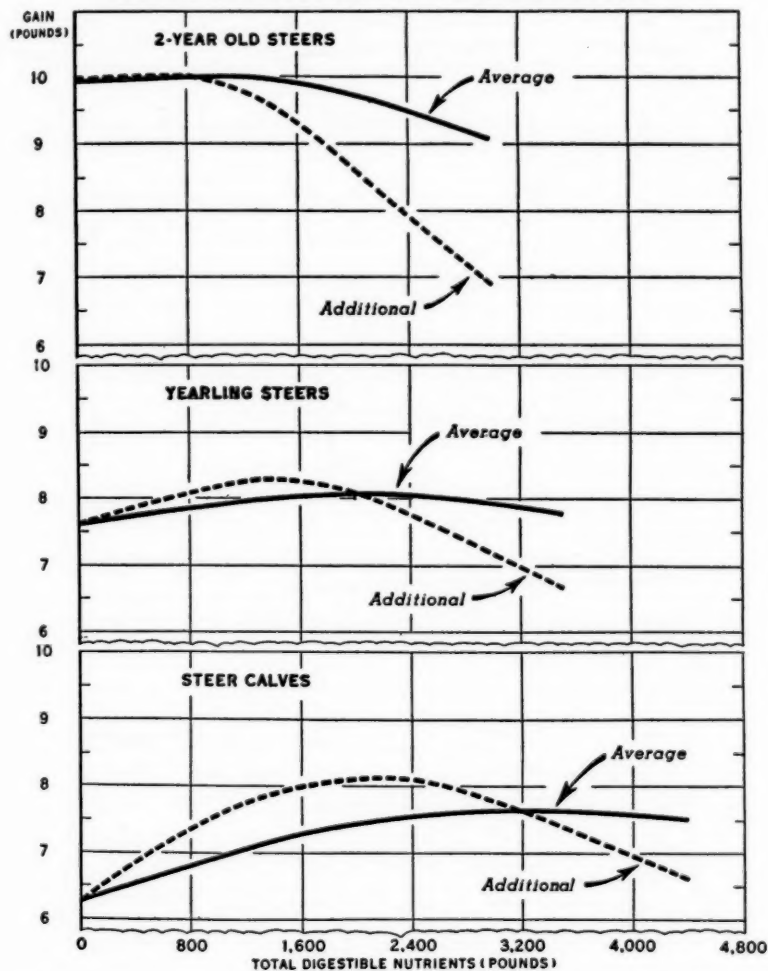
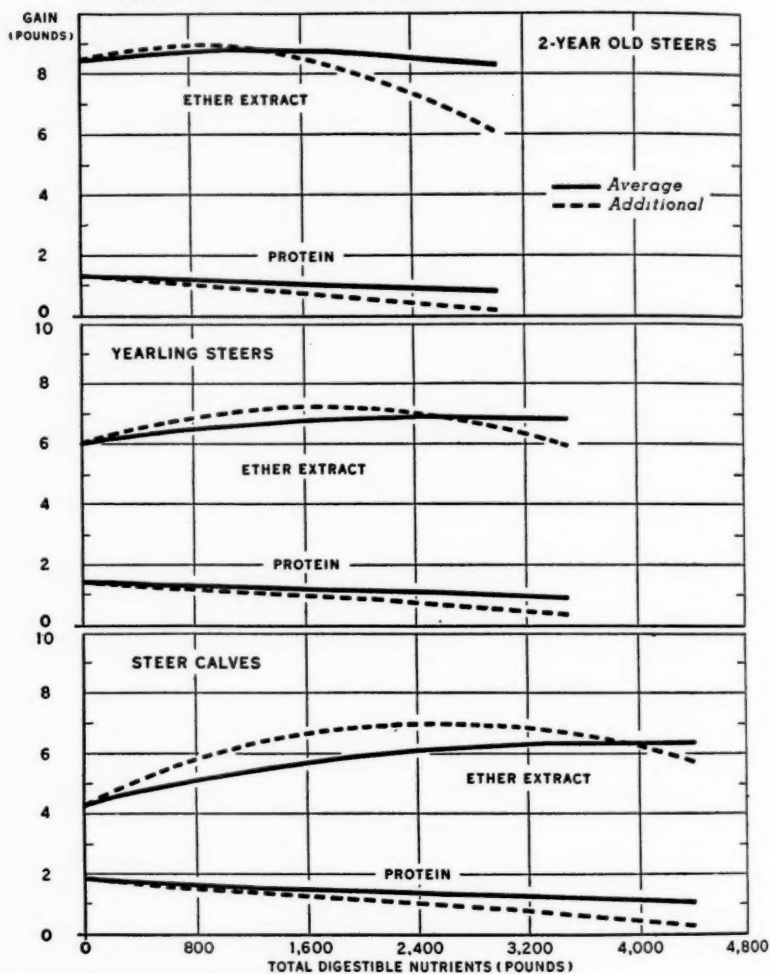


FIG. 4

**GAIN IN EDIBLE CRUDE PROTEIN AND EDIBLE ETHER EXTRACT
PER 100 POUNDS OF TOTAL DIGESTIBLE NUTRIENTS
CONSUMED THROUGHOUT THE FATTENING PERIOD**



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FIG. 5

ships, all segments of the curves are significant when considering cattle fattening programs where different ages of feeder cattle are involved; while when developing a program to maximize food production by fattening a given age of feeder cattle the declining segments of the curves are of greatest usefulness.

Gain in live weight per unit of feed

Efficiency of feed utilization as indicated by gain in live weight per 100 pounds of total digestible nutrients consumed by Choice feeder steers declines from the beginning of the fattening period. The additional output curve, therefore, is below the average output curve throughout the entire fattening period (Fig. 3). Gain in live weight per unit of feed is greater and decreases less rapidly throughout the fattening period for calves than for older feeder cattle. As indicated by the curve of additional output, calves at Good slaughter grade gain about 16.5 pounds in live weight for each 100 pounds of total digestible nutrients compared with about 11.4 pounds gain in live weight at Choice slaughter grade, a decrease of about 31 percent. Comparable figures for yearlings are about 15.1 and 10.0, respectively, a decrease of about 34 percent. For 2-year old steers, the decline in efficiency of feed utilization is even greater. Comparable gain figures for 2-year-olds are about 15.2 and 9.4 pounds, respectively, or a decrease of about 38 percent.

Gain in edible nutrients per unit of feed

While efficiency measured by gain in live weight declines from the beginning of the fattening period, efficiency of feed utilization measured by gain in pounds of edible body nutrients (crude protein, ash and ether extract) increases during the first part of the fattening period and then declines (Fig. 4).⁵

⁵ This indicated relationship is in accordance with experimental results and judgment of leading investigators of the subject. Armsby concludes that "On the whole, the results of these experiments seem to indicate, if anything, a rather lower percentage utilization by the young animals as compared with the older." His hypothesis on this question is that "the conversion of feed protein into tissue requires a considerably greater relative expenditure of energy than does the conversion of surplus feed into fat, the difference representing what might be called the work of organization." (H. P. Armsby, *The Nutrition of Farm Animals*. Macmillan Co. 1917, p. 393 and p. 395, respectively.)

Hogan and associates at the Missouri Agricultural Experiment Station, investigating Armsby's hypothesis that the percentage retention of net energy may increase with age, conclude that for hogs "within reasonable limits, energy is stored more economically in the latter rather than the earlier months of the feeding period." They also studied Haecker's Minnesota data on cattle and find it "in

Comparison of Figures 1 and 4 indicates that the point of greatest efficiency, measured by pounds of edible body nutrients, occurs for the 2-year-old steers just before average Good slaughter grade is reached; for the yearlings, just beyond average Good slaughter grade; and for calves, at about Choice slaughter grade. As was true for gain in live weight, the efficiency of feed utilization declines more rapidly for the older feeder than for calves after the maximum is reached. However, while calves gain more pounds live weight per unit of feed than older animals, the converse is true of gain in pounds of edible nutrients per unit of feed. At the point of maximum efficiency the steer calves gained 7.6 pounds of edible nutrients per 100 pounds of total digestible nutrients consumed, compared with 8.1 and 10.0 pounds for yearlings and 2-year-olds, respectively.

In considering efficiency of producing edible nutrients by fattening cattle, it is important to remember that the various nutrients are joint products and the efficiency with which each is produced should be given consideration. The quantity of crude protein produced per unit of feed declines from the beginning of the fattening period (Fig. 5) while the efficiency of producing ether extract increases during the first part of the feeding period and then declines. The maximum efficiency in terms of ether extract for the 2-year-olds occurs just beyond average Good slaughter grade. Yearlings are close to average Choice slaughter grade and calves are beyond average Choice slaughter grade before the maximum efficiency of producing ether extract is reached.

Other relationships

Along with the above measures of efficiency, gain in edible body or in calories per unit of feed also could be used. Efficiency measured by gain in edible body falls between efficiency measured by

essential agreement with ours, and that the more mature animals made gains in energy more economically than those that were younger." (A. G., Hogan, et al. *The Relation of Feed Consumed to Protein and Energy Retention*. Mo. Agr. Exper. Sta. Res. Bul. 73, 1925, pp. 26 and 27.)

Morrison points out that the fat animal "needs a greater proportion of its feed for maintenance than the one which is not yet well fleshed, because of two factors: First, the maintenance requirement of a fat animal per 1,000 lbs. live weight tends to be higher than for a thinner one; and second, the fat animal eats less feed per 1,000 lbs. live weight, consequently having less nutrients left for meat production after maintenance requirements have been met," indicating that while efficiency of feed utilization may increase with age the fat animal is less efficient. (F. B. Morrison, *Feeds and Feeding*. 20th Edition. Morrison Publishing Co., 1937, p. 151.)

gain in live weight and by gain in edible body nutrients, and declines through the fattening period for all three ages of cattle. Efficiency measured by calories produced per unit of feed increases and later decreases similar to efficiency measured in terms of pounds of edible nutrients. However, maximum efficiency indicated by calories occurs later in the fattening period, the 2-year-old steers being about Good slaughter grade, the yearling steers Good-to-Choice, and the steer calves Choice-to-Prime before the point of greatest efficiency is reached.

Relationships between gain in live weight and gain in food products produced

The various measures used to indicate efficiency of converting feed into human food clearly demonstrate that gain in live weight only partially and somewhat inadequately indicates the quantity of food products produced with a given quantity of feed. In Table 1 comparative estimates between the gain in live weight and selected indicators of food production are given for Choice feeder calves, yearlings, and 2-year-old steers from the beginning of the fattening period to average Good and average Choice slaughter grades.

TABLE 1. ESTIMATED PERCENTAGE INCREASE IN LIVE WEIGHT, EDIBLE BODY AND EDIBLE NUTRIENTS ON CHOICE FEEDER STEERS FATTENED TO AVERAGE GOOD AND AVERAGE CHOICE SLAUGHTER GRADES

Item	Estimated increase on choice feeder steers fattened to:					
	Good slaughter grade			Choice slaughter grade		
	Calves	Yearlings	2-year-olds	Calves	Yearlings	2-year-olds
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Live weight	100	42	24	150	69	42
Edible body	125	59	37	210	106	72
Lean	84	36	19	127	59	33
Fat	329	145	100	626	286	210
Edible nutrients	206	97	65	375	187	135
Crude protein	82	35	18	122	56	31
Ash	76	34	15	120	53	26
Ether extract	342	148	102	653	294	216
Calories in edible product*	260	119	81	485	233	170

* Calculated on the basis of 1,814.4 calories per pound of crude protein, and 4,082.4 calories per pound of ether extract.

While the relative increase in lean meat and crude protein is slightly less than the gain in live weight, the relative increase in fat is considerably greater. From the beginning of the feeding period to average Good slaughter grade the increase in pounds of edible nutrients ranges from about twice the gain in live weight for the steer calves to nearly three times the gain in live weight for the 2-year-olds. Animals fed to Choice slaughter grade show an even greater relative increase in edible nutrients compared with gain in live weight. The relative increase in calories is greater than the increase in edible nutrients. The average animal put on grain feed in the Corn Belt is thinner and grades lower than a Choice feeder and a greater percentage increase in nutrients and calories relative to gain in live weight would be obtained.

Comparing different ages of feeder cattle there is less difference in relative increase in live weight and in edible body nutrients and calories for calves than for older animals. Since calves grow more than older animals a larger part of the gain is bone and other non-edible products. Moreover, a larger proportion of the gain is protein which has a relatively lower caloric content per pound than ether extract.

Limitations of measures of relationships

When using any measure of gain in calculating efficiency of feed utilization a clear understanding of what is involved is essential. All summary measures of efficiency have limitations. Efficiency measured in terms of live weight reflects neither the increase in dressing percent nor the improvement in nutrient content of the carcass. The live animal contains a large amount of non-edible product and water which clouds the picture of how much food is produced per unit of feed. Efficiency measured in terms of edible body reflects the increase in dressing percentage and the elimination of the non-edible product, but the improvement in nutrient content is still clouded by the large amount of water present in the edible body. These objections are overcome by using nutrients or calories as measures of gain. However, using nutrients or calories raises a question regarding weighting in combining the various constituents of the edible body. In arriving at a total for edible body nutrients the crude protein, ash and ether extract were added pound for pound. Converting to calories gives a somewhat heavier weighting to ether extract relative to crude protein than a pound for pound

ratio. Neither weighting is adequate for all purposes. The weighting to be used would depend upon the need for various constituents in the diet and would vary from time to time according to supply and/or sources of production.

While no one measure of efficiency is entirely adequate where a common denominator is required to express the combined gain of the various constituents produced per unit of feed, pounds of edible nutrients or calories probably more clearly portray efficiency than either live weight or edible body weight. In using these summary measures, however, cognizance of the efficiency of producing individual constituents is essential and the advisability of adjusting the weighting of the various constituents should be given full consideration.

Significant Relationships

Gain in live weight, the measure most frequently used in determining efficiency in cattle feeding, portrays only a part of the gain and therefore is inadequate as a measure of efficiency. The analysis demonstrates that a different output curve is obtained and conclusions are altered when the change in dressing percentage and the improvement in carcass during the fattening period are considered. The analysis of gain in edible nutrients or calories per unit of feed consumed indicated an increase in efficiency during the first part of the fattening period, followed by a decline, while gain in live weight per unit of feed consumed declined from the beginning of the fattening period. It should be recognized, however, that were protein given a sufficiently heavy weighting, efficiency would decline during the entire fattening period.

A corollary of the concept of increasing efficiency during the first part of the fattening period is the fact that with comparable feeding patterns, greater quantities of edible nutrients or calories are produced per unit of feed consumed by older than by younger animals. However, calves are more efficient in producing crude protein than are older feeders which would make advisable the fattening of younger feeders were animal protein at a premium.

Fattening cattle compares reasonably well with other livestock enterprises when efficiency of gain is analyzed on the basis of edible nutrients or calories produced by cattle not fattened beyond the point of maximum efficiency. The frequent rating of fattening cattle below other livestock enterprises in the efficiency of convert-

ing feed into food is not always justified. The reasons for this apparent low rating are that too frequently (1) consideration is not given to the increase in dressing percentage and in food nutrient content of the beef carcass during the fattening process, and (2) the variation in efficiency throughout the fattening period is not fully recognized, the long-fed steer frequently being used in comparisons with other kinds of livestock. As indicated by the above analysis, the gain in edible product and nutrients by fattening cattle is considerably greater than the gain in live weight. As an example, a 600-pound Medium-to-Good feeder steer fattened to a 950-pound slaughter animal increases only 58 percent in live weight, whereas the increase in calories is 149 percent; in fat, 196 percent; and in protein, 54 percent.

Comparative estimates of the edible product and food nutrients produced per 1,000 feed units utilized to fatten cattle and to produce selected other livestock products are given in Table 2.

TABLE 2. COMPARISON OF EDIBLE PRODUCT AND FOOD NUTRIENTS PRODUCED PER 1,000 FEED UNITS BY FATTENING CATTLE AND OTHER LIVESTOCK^a

Class of livestock and kind of product	Yield per 1,000 units of feed consumed ^b			
	Edible product	Calories	Fat	Protein
	Pounds	Thousands	Pounds	Pounds
Fattening cattle:				
Food products ^c	76	157	36	8
Dairy cows:				
Whole milk	901	276	34	31
Butter ^d	69	212	51	2
Hogs:				
Pork and lard	135	349	80	13
Chickens:				
Eggs	165	113	18	20
Meat	103	83	12	19

^a These data are based upon an unpublished report by R. D. Jennings, BAE, and upon "Using Resources to Meet Food Needs," by Raymond P. Christensen, BAE, USDA, May 1943.

^b A feed unit as used here is one pound of corn or a quantity of other feed having the same feed value as one pound of corn.

^c Assuming a Medium-to-Good grade 600-pound feeder steer fattened to 950 pounds. An allowance for pork and lard produced on feed wasted by cattle is included.

^d Includes an allowance for pork and lard produced from skim milk.

Importance of Physical Relationships

Input-output relationships are pertinent both as a dependable guide to policy determination for food production programs and as

a foundation of analysis of costs and returns relationships. Once the end desired has been defined the relationships portrayed in the foregoing analysis provide tools for use in determining policy for achieving that end. If, for example, the end objective in fattening cattle has been determined to be improvement in quality of beef, the relationships indicate that efficiency of fat production is greater for older than for younger feeders and that for hardy cattle of good conformation efficiency is maintained during the first part of the fattening period but declines when the animal is fattened to a high degree of finish. On the other hand, if the end objective desired by fattening cattle is maximum production of protein, these relationships emphasize the point that while efficiency declines throughout the fattening period for all ages, younger feeder cattle are more efficient than older animals in producing protein.

The food *production* program developed with the aid of physical input-output relationships would need modification in accordance with food *consumption* requirements and tastes. Naturally both the production and consumption phase must be given full consideration in food program policy determination. As an example, input-output relationships indicate efficiency of fat production by Choice feeder steer calves does not decline until they are Choice-to-Prime slaughter grade. However, various studies indicate that the Good grade slaughter animal contains about as much fat as the average individual will consume along with the lean. Therefore, when feed is scarce food consumption policy would indicate the desirability of modifying the food production policy, and of fattening Choice feeder steer calves only to Good slaughter grade, thereby saving a relatively large amount of feed to fatten additional cattle or produce other products. The feed used annually to fatten cattle in the Corn Belt beyond average Good slaughter grade during the period 1938-39 to 1941-42 would have been sufficient to fatten an additional 1.7 million head (assuming normal feeding and management practices except that none of the cattle would have been fattened beyond average Good slaughter grade).⁶ If additional feeder cattle of desirable feeder grade were not available the feed saved by not fattening any cattle beyond average Good slaughter grade probably should be used for feeding other kinds of livestock which would make more efficient use of the feed.

⁶ For a comprehensive and detailed discussion of this phase of a cattle fattening program, see: Aaron G. Nelson, *Relation of Feed Consumed to Food Products Produced by Fattening Cattle*. USDA Technical Bul. No. 900.

An analysis of costs and returns based upon input-output relationships would serve as a basis for development of cost and price schedules for food programs required to achieve needed production of foods in periods, such as wartime or drouth, when production factors are scarce and maximum food production is essential. The introduction of monetary factors in the input-output relationships would facilitate determination of costs and returns relationships needed to yield a given profit to producers. For food production programs already under way, such analysis would assist in ascertaining conflicts between maximum production of essential foods and necessary profit to producers. Another important phase of a cost and returns analysis would be under conditions, such as peacetime, when production factors were ample, and satisfying the demand of consumers, as reflected by relative prices, was the only objective. By introducing monetary measures in the input-output relationships, adjusted as necessary for variations in feeder grade, alternative methods of handling cattle could be appraised to ascertain feeding and management practices which would give promise of the greatest profits to the individual producer for his cattle fattening enterprise.

Appendix

Determining the growth curve and standard error. In the experiments which served as a basis for the input-output analysis in this article the data observed are weights of animals (above certain initial weights) related to amounts of feed consumed. The growth curves were fitted to the data using the equation

$$(1) \quad w = A - Be^{-kf}$$

Where w represents the weight read from the curve, f represents the amount of feed consumed, e is the base of the natural logarithms equal to 2.71828 . . . ; and where A , maximum live weight attainable as a result of growth, B , gain in live weight made in reaching the maximum live weight, and k , rate of decrease in efficiency of feed utilization, are fitted constants determined from the data.*

* The method of fitting the growth curve is given in detail in connection with the article entitled, "Growth, Fattening and Meat Production," by O. G. Hankins and H. W. Titus in the 1939 Yearbook of Agriculture, p. 465. The equations for the growth curves of the three ages of Choice feeder steers are as follows:

Calves: $w = 1446 - 1049e^{-.000257f}$

Yearlings: $w = 1446 - 805e^{-.000251f}$

2-year-olds: $w = 1446 - 610e^{-.000372f}$

R. O. Been, Bureau of Agricultural Economics, USDA assisted in developing the method used in calculating the standard error for the growth curve.

The constant A is derived from the constant B and from the initial weight, w_0 . Since initial weight is the weight when feed is zero, we have

$$\begin{aligned}w_0 &= A - B \\A &= w_0 + B.\end{aligned}$$

This leaves only two constants which are actually determined from the data, B and k .

The actual technique of fitting the function to the data was accomplished in terms of a derived function from which the constant k was determined and the constants A and B derived. This derived function expresses the "efficiency," E , of feeding as a function of the amount of feed consumed. The feeding efficiency corresponding to any specified quantity of feed is defined to be equal to the rate of change in weight per unit change in feed. From the growth curve function it is possible to express efficiency as a linear function of weight.

$$(2) \quad E = \frac{dw}{df} = c - kw.$$

Estimates of observed efficiency were derived from the data and the linear function (2) was fitted. After the constants c and k are determined, the other constants in the growth function are determined by

$$(3) \quad A = \frac{c}{k} \quad \text{and} \quad B = A - w_0.$$

The process of determining the standard error of the growth functions required, first, determining the standard errors of the fitted constants c and k and the correlation in errors of these two constants and, second, determining the standard error of the function (1) in terms of standard errors of A , B , and k and their inter-correlations where these have been derived from the error and correlation values for c and k . By differentiating the growth function (1) in terms of sampling error variations in the constants A , B and k , it is possible to determine the standard error of the growth function as

$$(4) \quad \sigma_w^2 = \sigma_k^2 \left(M^2 \frac{\sum w^2}{n} + N^2 + 2MN\bar{w} \right).$$

In this equation

$$M = \frac{1}{k} (1 - e^{-kf})$$

and

$$N = \frac{c}{k^2} (e^{-kf} - 1) + (c - w_0)e^{-kf}$$

\bar{w} is the average of the observed weights and $\Sigma w^2/n$ is the average of the squares of the observed weights. σ_k^2 is the standard error of the regression coefficient in the efficiency function and is given by

$$(5) \quad \sigma_k^2 = \frac{\sigma_E^2(1 - r_{Ew}^2)}{(n - 2)\sigma_w^2}.$$

In this equation σ_E^2 and σ_w^2 are the standard deviations squared of the estimated efficiencies and the observed weights from which the efficiency function was calculated, r_{Ew} is the correlation coefficient between efficiency and weight and n is the number of efficiency and weight observations.

The standard error of the growth curve given in equation (4) is a measure of the sampling variation in the curve itself and does not refer to the scatter of observed points about the fitted curve. Its value calculated from the data in this study is, of course, only an estimate of its true value just as the growth curve determined here is an estimate of the true growth curve. If the *true* standard error of the curve, applying to estimates from samples of n observations, were laid off on either side of the *true* growth curve then it could be stated that about two-thirds of all growth curves derived from samples of this size would fall within the specified error band. When the *estimated* standard error is laid off about the estimated growth curve, interpretation and significance of the band thus obtained is much more difficult to describe. However, it may be said that the following statement about error zones of this type is valid: If estimated error zones of this type are determined repeatedly for a large number of samples of the *same size*, then about two-thirds of these zones will include the true growth curve.

THE NATIONAL FOOD ALLOTMENT PROGRAM

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IT WON'T be long before the American people will have to choose between food production control leading back to the thirties and consumption expansion leading ahead into the fifties. How could there be a problem of choice? Surely, our memories of the thirties do not evoke nostalgia; nor does regimenting farmers to cut down production appeal to the American temperament.

It is rather that the production control machinery is still intact, ready to be thrown into gear; we know how to operate it. What little we had of consumption expansion machinery, however, has been scrapped (e.g., the Food Stamp Program); we never have operated such machinery on a large scale, and we don't quite know what to expect. If we should slide back into production control, it will not be because we believe in it, but because we know how to do it.¹ Expanding consumption requires new machinery and learning how to use it; we are afraid of all sorts of difficulties and unpleasant surprises.

And yet there is no reason why we cannot survey a course of consumption expansion with a good deal of confidence in results. The basic facts are well known: (1) American farmers can and probably will produce more food than there will be an effective demand for at fair prices; and (2) there will be millions of people who are not getting enough to eat because they lack the purchasing power to make their want for food felt in the market. The basic problems are well known, too: (1) to increase purchasing power of consumers, and (2) to channel an appropriate part of such purchasing power to families whose consumption of major living essentials falls below minimum standards of adequacy.

The solution of these problems requires some government action, some "interference" with the automatic market forces. But so does

* The author acknowledges the valuable advice and criticism received by him from F. V. Waugh, Peyton Kerr, and Herman Southworth. The views expressed are solely the author's and do not necessarily reflect the official views of any government agency.

¹ So far, specific production controls are authorized only for the "basic commodities" under the 1938 Farm Act. It would, however, be possible to develop measures for encouraging output restriction of other commodities under price-support guarantees. Actual results in curtailing aggregate food production during the thirties have been negligible. See T. W. Schultz, "Economic Effects of Agricultural Programs," *Am. Econ. Rev.* Vol. 30, No. 5, Feb. 1941, pp. 136-140.

production control. "Normal" market forces have failed to bring forth sufficient adjustments in production and consumption necessary for a stable full-employment economy. While prices should be retained as an indispensable guide to the process of allocating productive resources, we cannot depend entirely upon the infallibility of automatic market forces in keeping consumption in step with capacity production. A full employment and high-consumption economy requires some experimenting in social engineering. Why is it that we are so enthusiastic about experimenting with scientific gadgets while looking so askance at experimenting with socio-economic arrangements?

U.S. food production will continue near war-time levels during the next few years and will continue its secular upward trend;² effective market demand will not absorb the total supply of many farm products at the guaranteed support prices even if we should maintain reasonably full employment. At the same time millions of American families will be seriously under-nourished. We can try to pare down production to whatever could be sold at parity prices and let those families go on starving; or we can try to tap the potential demand of these families for food by providing them with sufficient purchasing power to buy a reasonably adequate diet. This is precisely what the National Food Allotment Plan now before Congress is intended to accomplish.

Highlights of the Plan

The National Food Allotment Program grew out of the experiences of the Food Stamp Plan—which was in effect from 1938 to 1942. It was first introduced by Senator Aiken as Senate Bill S. 1331 on July 8, 1943. Hearings were held January 14–26, 1944. On February 10 and 11, 1944, this bill was offered as a Senate Committee amendment to House Bill H. R. 3477 providing for the extension of the Commodity Credit Corporation and was defeated on the Senate Floor by a vote of 29 yeas and 46 nays. On January 10, 1945, Senators Aiken and LaFollette reintroduced the bill in its original form (S. 185). In the spring of that year, however, the bill was completely revised in the light of the January 1944 hearings and subsequent analytical studies of the proposal, and a new bill was introduced by the same sponsors on June 15, 1945 as S. 1151

² See Sherman E. Johnson, "Agricultural Production after the War," this JOURNAL, Vol. 27, No. 2, May 1945, p. 266.

(79th Congress, 1st Session). The following discussion is based upon this latest version of the proposal.

The National Food Allotment Program has two broad aims: (1) to improve nutrition by making it possible for low-income families to purchase an adequate diet, and (2) to assist in maintaining fair farm prices and incomes by expanding and stabilizing the effective demand for food.

By supplementing the food purchasing power of low-income families through the issuance of food coupons, the Food Allotment Program would assure farmers of a sustained effective demand for food that would be largely independent of fluctuations in industrial employment and national income. By making payments at the rate of 40 percent of its income, each participating family would receive sufficient coupons to cover the cost of an adequate low-cost diet.

If the cost of an adequate diet were \$3.50 per person per week, a family of four could obtain food coupons worth \$14 per week. Such a family earning \$20 per week would pay \$8 for these coupons—40 percent of its income. If this family earned \$25 a week it would pay \$10 for the same amount of coupons.

The coupons would be spent like money in grocery stores. They would be valid only for the purchase of foods, and a portion of them (not more than one-third) could be designated for buying specified foods—foods in surplus or foods needed to relieve dietary deficiencies.

The Food Allotment Program would thus make it possible for every American family to secure enough food-purchasing power to buy an adequate diet. We have the productive capacity to achieve such an aim. The proposed program would assure continued full use of this productive capacity and would establish a nutritional floor below which no family would need to fall.

What effect would this program have on nutrition and on farm prices? How many families would be served by it, and how much would it cost the Government?

Effect on Nutrition

Malnutrition is widespread in this country. In 1942, a year of full employment, about one-third of all urban families fell in income groups where the average diet failed to meet recommended allowances for an adequate diet. During depressions, this proportion rises

rapidly. In 1935-36, almost 80 percent of all families had diets that were deficient in one or more of the basic nutrients.³

The proposed program would largely remove the predominant cause of malnutrition—inadequate purchasing power. The bulk of the additional food expenditures by participating families would be made for protective foods. The percentage of families suffering from malnutrition because of lack of purchasing power might be reduced from the current level of 30-35 percent down to 10-15 percent.

Effect on Farm Prices

To raise all low-income families in the United States to an adequate dietary standard without encroaching upon the consumption rates of the higher income groups, food consumption would have to be 35 to 40 percent larger than prewar—even higher than wartime food production.⁴ Preliminary estimates indicate that the program would probably keep farm prices of meat animals, dairy products, poultry and eggs, and most vegetables and fruits at or above the support level of 90 percent of parity during the reconversion period, even under conditions of substantial unemployment and declining national income. The demand for wheat, fats and oils (except butter), sugar, dry beans and peas would be strengthened but little, if at all. This means that the program would greatly reduce the need for direct price support.

³ For evidence of malnutrition, see *Family Food Consumption in the United States*. USDA, Misc. Publ. 550, p. 25; *Hearings before a Subcommittee of the Committee on Agriculture and Forestry*, United States Senate, Seventy-eighth Congress, Second Session, on S. 1331, January 14, 19, 21, 24, 25 and 26, 1944, p. 41 ff. and p. 76; and National Research Council, *Inadequate Diets and Nutritional Deficiencies in the U. S.*, Bul. 109, Nov. 1943.

⁴ This estimate is based upon 1941 data obtained from *Spending and Saving of the Nation's Families in Wartime*, U. S. Dept. of Labor, Bul. 723, 1942. If a nutritional floor had been established at \$145 per person per year (the cost of an adequate low-cost diet), total food consumption in 1941 would have been 17% higher than it actually was—provided such additional supplies could have been procured at the same prices. This would have resulted in an index of per-capita food consumption of 126 instead of 108 (1935-39=100). Applying this index of 126 to the increased population in 1945 and 1950, the following levels of food requirements are indicated:

	1941	1945	1950
	(1935-39=100)		
Per capita food requirement	126	126	126
U. S. population	103	108	112
Total food consumption required	130	136	141
Total actual food consumption	111	119	?

Cost of the Program

The number of participating families and the average Government contribution per family would rise and fall with the proportion of families in low-income groups. Hence, during depressions the cost of the program would be high, and during prosperity it would be low. The range would probably be from \$500-\$600 million to \$2-\$2½ billion, excluding administrative costs. With a national income of \$130 billion (in 1944 dollars) and unemployment of 8 to 10 million, the cost of the program with the expected degree of participation would be about \$1.3 billion.

Such costs may be compared with appropriations of about \$1.8 billion for the current food subsidy program (1945-46) and with AAA outlays in 1939 of nearly \$1 billion. The proposed Food Allotment Program would probably outrank these programs in terms of the efficiency with which Government expenditures are reflected in farm income.⁵

Relation to Other Agricultural Programs

The Food Allotment Program would greatly reduce the scope and size of *price-support operations* during the Steagall period (1) by maintaining a high level of effective consumer demand for food, and (2) by earmarking a portion of the food coupons for foods in surplus supply. A number of important farm products such as cotton, tobacco, and wheat would not be directly affected by the program.

Although the program would not eliminate the need for a *production goals program* coupled with forward prices,⁶ it would strengthen the prices of some products more than others, and this differential effect would encourage desirable shifts in production.

It would complement rather than compete with the *school-lunch program* which offers a direct means of meeting the particular dietary needs of children and adolescents. By promoting desirable changes in food habits, the school-lunch program would strengthen the nutritional education activities which would accompany the Food Allotment Program.

⁵ For a cogent discussion of the price and farm-income effects of food consumption subsidies, see Herman M. Southworth, "The Economics of Public Measures to Subsidize Food Consumption," this JOURNAL, Vol. 27, No. 1, Feb. 1945, and Gold, Hoffman and Waugh, *Economic Analysis of the Food Stamp Plan*, USDA, Special Report, Oct., 1940, pp. 86-87.

⁶ See R. Schickele, "A Price Policy for Agriculture," this JOURNAL, Vol. 27, No. 4, Nov. 1945, pp. 881-883.

Fiscal Policy Aspects

With the economy at full employment funds required for the program would be relatively small. During periods of mounting unemployment an increasing number of families would participate as their incomes decline, and the program would expand automatically. The resulting increase in Government expenditures under the program would tend to maintain total food expenditures and to retard a downward swing in farm prices.

At the same time it is quite likely that participating families would spend a larger part of their reduced incomes for non-food commodities than they would without the program.⁷ Hence, the demand for non-food consumer goods would also be strengthened. Moreover, the propensity to consume of these low-income families is very high.

From a fiscal viewpoint, therefore, the Government expenditures under the program are strongly anti-cyclical in nature: (1) they vary inversely with national income and employment, and (2) they increase the community's propensity to consume more the larger they are. A given amount of federal funds spent under this program would be more fully reflected in immediate demand for consumer goods and services than if it were spent on public works or for direct farm price-support operations.⁸

These fiscal characteristics of the program should commend it for an important role in developing a "National Budget" designed to close any prospective "expenditure gap" that may develop between national income and expenditures.

*Main Provisions of The Program**Determination of the Basic Food Allotment*

Senate Bill S. 1151 defines the basic food allotment as "the following amounts of food per person per week or the equivalent thereof in nutritional value and approximate cost as determined by the Secretary:

⁷ The reason for this is that as income declines a larger proportion is normally spent for food. The price of the coupons, however, remains at 40% of the money income of participants.

⁸ There is reason to believe that a considerable part of subsidies to farmers for price-support or production-control payments is likely to be saved, since the bulk of such subsidies tends to go to highly commercialized and relatively prosperous farmers.

Milk, or its equivalent in cheese, evaporated milk, or dry milk	5½ quarts
Potatoes and sweet potatoes	3 lbs. 7 ounces
Dry beans, peas and nuts	8 ounces
Tomatoes and citrus fruits	1 lb. 10 ounces
Green or yellow vegetables, such as green cabbage, kale, snap beans, and carrots	1 lb. 9 ounces
Other vegetables and fruits	2 lbs. 6 ounces
Eggs	4 (no. of eggs)
Meat, poultry and fish	1 lb. 12 ounces
Flour and cereals (enriched or whole grain)	4 lbs. 4 ounces
Fats and Oils	14 ounces
Sugar, sirups, and preserves	11 ounces

The Secretary may add to or delete commodities listed, or may change quantities in the several categories if he deems such changes necessary or appropriate in view of the new research in nutrition, and may increase the basic food allotment for those individuals or groups who are in need of special nutritional supplements."

The Bill further provides that "the Secretary shall determine at least semi-annually the prevailing retail cost of the basic food allotment for households within each size classification, taking into consideration the purchasing practices of families with low income."

There are various methods by which the value of the food allotment might be determined: (1) the standard diet described in the Bill could be priced by multiplying the quantities specified by their respective retail prices as reported by the BLS; or (2) on the basis of a family-expenditure survey, the amount of total food expenditures could be determined which, at the time of the survey, actually provided a low-cost diet nutritionally equivalent to the diet described in the Bill.

The first method has a serious weakness: it offers little opportunity for allowing necessary adjustments for prevailing food habits and various imperfections in the shopping process which make it difficult at any given time for a housewife to buy precisely the kinds of food that would make up a balanced diet. Such a theoretically priced diet, therefore, does not take into consideration "the purchasing practices of low-income families" as provided in the Bill, and understates the cost for the average participating family. The second method has the disadvantage that family-expenditure studies are expensive to undertake and keep up-to-date.

Perhaps the most feasible approach would be a combination of these two methods. The actual food expenditures of families barely achieving adequate nutrition might be determined from the most recent family-expenditure data. At the same time, the standard diet might be priced by using the retail prices quoted for the year

in which the expenditure study was made. The percentage excess of such actual food expenditures over the theoretically priced diet would indicate the approximate magnitude of the necessary upward adjustment in the latter. After the food allotment value has thus been determined, it could be revised semiannually according to the percentage change in the BLS index of food prices.⁹ Another possibility would be to replace the low-cost diet specified in the Bill by a *moderate* cost diet which, if valued at the retail price quotations, would give a food allotment value sufficiently high to permit participating families actually to buy a diet at least equivalent to the low-cost adequate food allowances.

The Bill provides that "if he deems it necessary, the Secretary, in determining the prevailing cost of the basic food allotments, may provide for regional differentials and differentials by size and type of community." Such differentials in value would probably be necessary as between several major regions, and at least between urban and rural communities within each region.

Applying for Participation

Any family could apply for participation by submitting two statements of fact: (1) the number of members in the household, and (2) the monthly household income. The "household" is defined as "one person who alone, or a group of two or more persons who at a common table, customarily consume food prepared by or for him or them in a home or noncommercial, nonpenal institution." "Household income" is defined as "the total amount of money received by all persons in a household and available to pay the ordinary expense of the household," less such portions of public-assistance payments and of amounts received by persons other than the head of the household as the Secretary may deem it equitable to exclude.

It is important to minimize any social stigma that might attach to participation. Elaborate means-tests should be avoided by depending in the first instance upon "self-certification." Applicants would fill out simple forms similar to the short income-tax forms, listing members of the household and all income received by them.

⁹ It has been estimated that in the spring of 1942, the food allotment value per person in urban areas would have been \$170 per year. Since the food cost index advanced from 119 to 139 by the end of 1945, the urban food allotment value would now be around \$200.

Some spot checking would be necessary, but this need be no more elaborate than the checking done to prevent evasion of income taxes. Records of the Social Security Agency, the Bureau of Internal Revenue, and various State agencies could be used for checking the income declarations of many participants.

To prevent the program from reducing incentives to seek employment, the Bill provides that the Secretary "may require any unemployed male member of a household applying for food-allotment coupons, who is between the ages of 16 and 65 and is not attending school or disabled, to submit (1) a certificate from a public employment office that he is registered for work, and (2) an affirmation that he has not within the past six weeks refused suitable work." The Secretary, however, should use this authority but sparingly; general requirement of such a certification might open the door to unfair discrimination against certain individuals or minority groups.

Purchasing the Food Coupons

In principle the food coupons should be sold for an amount equal to the normal food expenditure of the participating family. If a family of three has been spending \$30 per month for food, it could buy \$48 worth of coupons for \$30. In this case there would be no diversion to non-food uses of money formerly used for food. If a family formerly spending \$40 for food could buy \$48 worth of coupons for \$30, it could divert \$10 to clothing or furniture and still obtain an adequate diet. In terms of the general welfare this might not be objectionable; in terms of the purpose of the program, however, it would mean that only \$8 of the \$18 contributed by the Government to improve nutrition would actually be used for this purpose. Conversely, if a family normally spending \$20 for food were required to pay \$30 for coupons, it might find participation very difficult as it would have to reduce non-food expenditures such as rent or clothing by \$10.

Administratively, it would not be feasible to determine precisely how much each applicant normally spends for food. The price to be charged each family for its food coupons, therefore, must be determined on the basis of some average amount which represents the prevailing spending habits of participating families. Several expenditure surveys indicate that low-income families with a moderately adequate diet spend an average of about 40 percent of their money income for food. In the lowest income groups where diets

are highly inadequate, the proportion spent on food averages around 50 percent. On balance, it appears that 40 percent of each family's money income would be an equitable charge which would minimize diversion of income from food to non-food uses on the one hand, and would encourage participation by families in the lowest income brackets on the other.

The Bill provides that the prices charged to various households "shall be not less than 25 percent of the face value of the coupons" and "shall not be more than 40 percent of the household income or 25 percent of the face value of the coupons whichever may be the greater." Hence, a family of three with less than \$30 monthly income would be charged the minimum price of \$12 (i.e., 25 percent of \$48), because 40 percent of its income would be less than 25 percent of the allotment value. This provision is intended to prevent shiftless families from receiving food practically free of charge. On the other hand if the same family would earn \$120 per month or more, it would not benefit from the program, since it would have to pay \$48 or more (40% of its income) for \$48 worth of coupons.

In determining the face value of food coupons to be allotted to a household, the retail value of home-produced and consumed food—*particularly important regarding farm families*—and of the food eaten outside the household is to be deducted from the basic food allotment; this requires a corresponding adjustment in the price charged such families for their coupons.

Upon receipt of an application in the local office, the amount of coupons to be allotted would be calculated on the basis of the declared size of the household, and the purchase price for the coupons would be determined on the basis of the declared household income—with modifications as to home-produced food and meals eaten out. A purchase form would be returned to the applicant, stating the terms of participation, the amount of coupons allotted and their price, the place where the coupons could be bought upon presentation of the purchase form. Since many applicants will not be able to pay in advance for a whole month's food allotment, weekly or semi-monthly payments might be permitted. No participant, however, would be allowed to purchase only part of his allotment.¹⁰

¹⁰ If, for instance, a family could buy half its food allotment for 20 percent of its income, the family could continue living on an inadequate diet by diverting money formerly used for food to non-food uses.

Redemption of Food Coupons

Food coupons would be issued in convenient denominations and would be accepted as legal tender by any food dealer who has been authorized by the Secretary to receive food coupons. Redemption of the coupons would be arranged "through the cooperation of the Treasury Department, the General Accounting Office, and banking institutions throughout the Nation." The Bill contains specific provisions regarding issuance and redemption of the coupons and for preventing abuses.

Designation of Coupons for Specific Foods

The Bill proposes one limitation on the general rule that coupons could be exchanged for any kind of food. In order (a) to channel local or temporary market surpluses into consumption and thus prevent spoilage or undue depression of prices, or (b) to stimulate the consumption of certain foods in which the diets of participants are found to be seriously deficient, the Bill gives the Secretary authority to "(1) require that each household . . . use not more than 33 $\frac{1}{3}$ percent in face value of such coupons to buy specifically designated foods, or to buy any one of a group of foods, or (2) include with food-allotment coupons sold other such coupons which from time to time may be used in exchange for specifically designated foods. The aggregate value of free coupons issued shall be not more than 10 percent of the aggregate value of coupons sold in the preceding six-month period or estimated as likely to be sold in the current six-month period."

For instance, if a seasonal surplus of potatoes or eggs should develop in a certain region, the Secretary could designate allotment coupon No. 9 or a free coupon labeled "C" to be used for the purchase of potatoes or eggs only, for a period of one month. Similarly, if local health authorities in a certain area should detect an acute deficiency of vitamin C in the diets of low-income families, allotment coupon No. 12 or free coupon "E" might be earmarked for the purchase of citrus fruits and tomatoes.

To insure that this earmarking of coupons is kept well within the limits of a nutritionally balanced diet, the Bill provides that at no time shall more than one-third of the coupons be restricted to specific foods, or more than one-tenth of the value of the allotment coupons be issued free for the purchase of specified foods. It also instructs the Secretary to "provide for the appointment of

a Council on Nutrition to advise on nutritional aspects of the food-allotment program."

This designation of coupons for specific foods would involve difficulties of enforcement. But even if compliance were far from perfect, the earmarking of coupons would still improve the effectiveness of the program in preventing surpluses and improving nutrition.¹¹ Some conflict may arise occasionally between these two objectives, but they are essentially complementary rather than conflicting, since increased food consumption by low-income families will improve nutrition as well as expand food markets.

Educational Program

Since the food allotment program represents a public investment in the nation's health, the Government would have a legitimate concern in the way participating families spend their food coupons. Accordingly the Bill instructs the Secretary to "provide, in cooperation with existing agencies of the Federal, State or local governments, or private persons or groups, an educational program for improving the buying habits, food-utilization techniques, and food-preservation methods of the participants in the food-allotment plan."

Educational material could be distributed with the food coupons which would provide simple instructions and advice regarding the wisest way coupons could be spent to obtain a balanced diet. Discussion meetings and demonstrations on nutritional problems might be arranged in areas of heavy participation in the program. By radio, newspapers, and other information channels, participants as well as other consumers could be advised regarding the foods that are in ample supply and relatively low in price at any given time and place.

The Food Allotment Program could serve as an effective vehicle for disseminating nutritional information among those parts of the population that need it most and yet have the least access to such information. By offering participants the concrete benefit of being able to buy *more* food, an opportunity would be provided

¹¹ This method of earmarking coupons for certain foods could be made more effective in moving a certain food into consumption than was the use of orange stamps for a long list of "surplus" foods under the Food Stamp Program. If, for instance, the value of coupons earmarked for eggs would represent the normal expenditure for eggs plus what it would take to move the surplus (within reasonable nutritional limits), consumption could be expected to increase almost accordingly.

for increasing their understanding of what constitutes *better food*—i.e., the composition of diets that are best adapted to needs which vary with age, occupation, and other factors.

Some Critical Issues

So much for the general outline of the proposed program. It represents a far-flung national food policy designed to modify the pattern of food distribution in the direction of establishing a nutritional floor below which no American family needs to fall. Its purpose and scope imply many socio-economic and political issues of fundamental importance to modern democratic society.

Income Distribution Aspects

The economic functions of a modern democratic state can be defined in terms of two basic goals of public policy: (1) to promote the maximization of the social product (or national income) by assuring full and efficient employment of the nation's labor and other productive resources; and (2) to promote a pattern of income distribution which imparts substance to the democratic tenet of equality of opportunity by assuring every individual access to a minimum amount of such goods and services as is essential for developing his talents, expressing his personality, and contributing to the community according to his best ability. Our elementary school system, public health services, the various social security programs, and the fiscal policy of progressive taxation and regressive expenditure represent implementations of this basic policy goal.¹²

The Food Allotment Program would in effect assure every family access to an adequate diet. It would still be a voluntary choice on the part of the family whether it wants to take advantage of this opportunity; but malnutrition on account of lack of income would no longer constitute an unsurmountable obstacle to health, to the physical and mental development of the family members. The program would place food on a comparable basis with education by making a minimum amount required for the normal functioning of a person available to everyone.

¹² For a fuller discussion of distribution policy in this context, see A. L. Macfie, *Economic Efficiency and Social Welfare*, Oxford Univ. Press, 1943; John H. G. Pierson, "Underwriting of Aggregate Consumer Spending," *Am. Econ. Review*, March 1944; and Rainer Schickele, "Optimum Income Distribution as a Goal of Public Policy," *Amer. Journ. of Economics and Sociology*, April, 1944.

If the total food supply were fixed, such a program would involve a shift of food from the higher-income groups to the lower-income participants. According to marginal utility theory, this transfer would tend to increase total satisfaction from food consumption.¹³ Fortunately, the productive capacity for food, even with the present size of the farm plant, is still far from being exhausted. The increased food demand generated by the program, therefore, can be expected—at least after a few years' time needed to bring forth the full production response—to stimulate corresponding production increases which would leave the consumption rates of non-participants virtually unaffected. Since the program would be financed from income taxes and public borrowing, the bulk of the required funds would come out of individual and corporate savings rather than current consumer expenditures.

Why Single Out Food?

The question is often raised, Why single out food? Would it not be better to supplement inadequate incomes by cash payments, or—better yet—see to it that full employment is assured and that every family earns enough income to pay for the minimum adequate essentials of living? Many families lack adequate medical care or housing or clothing even more than food. If we succeed in maintaining full employment and in establishing minimum wages sufficient to meet the essential items in the family budget, we would not need a food allotment program.

This might indeed be preferable. Pending the full achievement of these goals, however, wide-spread malnutrition and its attendant damage to health and morale will persist. To the extent to which the goals of full employment and of the establishment of an income floor are being approached, participation in the food allotment program will automatically decline. Families who earn enough to meet the normal budgetary needs for adequate nutrition derive no benefit from the program.¹⁴ The fewer the families falling below

¹³ Current levels of total food supply in this country would be sufficient to give everyone a reasonably adequate diet; this, of course, does not hold for many other countries, particularly in Asia. There, the main food problem is still to raise farmers' productivity; better food distribution could alleviate the impact of scarcity, but could not eliminate malnutrition.

¹⁴ Consumer subsidies in cash, such as children allowances, pensions and bonuses, would figure as income under the program. Hence, if they are sufficiently large to raise the per capita income above $2\frac{1}{2}$ times the value of the food allotment, participation would bring no benefit to the family.

the minimum standard of income adequacy, the smaller the scope of the program. For a long time to come, however, there will be a substantial number of families who for one reason or another will not receive enough income to feed its members properly. *The important point is that full employment, minimum wage, and other social security policies are not in conflict with the food program; instead, the latter could be conceived as complementary to the former.*

There is another aspect to this problem. It can be argued that national nutrition is vested with a public interest on account of its effect on the population's health, morale, and productive resourcefulness. In fact, the basic justification of such a program rests squarely upon such an argument. If this position is accepted, the main question is whether the specific proposal of the food allotment program is the most effective and feasible measure available, and not whether there should or should not be a food distribution policy. Since food consumption involves regular current expenditures by individual families, direct supplementation of families' purchasing power for food offers itself as a simple and logical approach.¹⁵

A similar argument, of course, can be made for medical care, which is also vested with a public interest. In this case, however, it might be more feasible to establish a minimum floor of adequacy—not by means of direct income supplementation, but by expanded public health services and universal health insurance schemes. The establishment of minimum housing standards would require still different techniques of implementation. The common feature of all such measures is that they serve the basic public policy goal of improving the distribution of real income among the population for the purpose of providing more effective equality of opportunity.

Effect on Incentive to Work

Inasmuch as the program would enable low-income families to get adequate food without spending more on grocery bills than they had previously, their incentive to work more or better in order to increase their income might be reduced. This argument can be

¹⁵ There are other approaches, such as the "peoples restaurants," community kitchens, milk for nursing mothers and infants, school lunches, etc. Most of these food programs are directed to relieve the distress of specific "vulnerable groups" of the population, and need not be in conflict with a general food allotment program.

made for almost any public measure which increases the income of a person without any additional effort on his part. An increase in basic wage and salary rates, expansion of any kind of public services, social security benefits—even a price reduction in important goods and services—could presumably have such an effect. Undoubtedly there will always be some persons who just don't care to improve their living standards beyond a certain level, and if they can maintain that level with less effort than formerly they will exert themselves less.

The question is, to what extent are these indolent persons outnumbered by others who would exert themselves more, who would work better and expand their ambitions if wider opportunities were offered? Nutritional deficiencies and ill health are notoriously associated with low productive efficiency, with lack of ambition and morale. Families in abject poverty often lack the physical stamina and mental alertness needed for seizing opportunities and developing higher skills and better working habits. More often than not have these families been born into such poverty-stricken environment that it is hardly justifiable to blame their situation on their innate personal character and lack of ability. Certainly the children cannot be made responsible for the deprivations their parents must endure, nor for the mental and cultural environment in which they grow up.

Evidence throughout western civilization seems to suggest that neither poverty nor affluence creates an environment which challenges persons to develop their abilities and to apply themselves in constructive ways. With respect to food there is ample specific evidence of nutritional deficiencies depressing the physical and intellectual performance of persons. It stands to reason that the net effect of a food allotment program upon the productivity and alertness of participants would be more likely positive than negative.¹⁶ This would hold particularly since the families would not get food for nothing, but would buy it with their own money—although at a discount—and would have to discipline themselves to a more regular budgeting of their expenditures which in itself encourages habits of thrift and foresight. The provisions establishing a mini-

¹⁶ A. C. Pigou, in his *Economics of Welfare*, says: "If increased wealth removes influences that make for the elimination of the unfit, it also removes influences that make for the weakening of the fit. The total effect of this twofold action may well be beneficial rather than injurious." 4th Ed. p. 118.

imum price of 25 percent of the food allotment value, and of requiring in certain cases certification by a public employment agency would further limit the possible effect of reducing incentive.

Indeed, it probably would be more realistic to regard such a program as a profitable public investment in the nation's human resources. In view of the production capacity of American agriculture, and as long as the demand for labor in non-agricultural occupations is being met, the nation can only gain from utilizing whatever labor resources there are in agriculture as fully as possible, and at the same time reducing malnutrition among city as well as farm population to a minimum.

Administrative Problems

Any program of so wide a scope involves many administrative problems. Without going into details, the nature of some of the more important issues should be pointed out.

Income Declaration

Perhaps one of the most serious difficulties arises with respect to the income declaration upon which the price of a family's food allotment coupons is to be based. A reasonably accurate report on the family's income is required. For most of the regularly employed wage earners and persons covered by the Social Security Program, no serious problems would be faced. But for self-employed persons, casual or transient workers, and farmers, considerable difficulties must be overcome. Probably the majority of eligible families would have incomes so low that they are not required to file income tax returns. Experience of Federal and State agencies in collecting income data for families in these low brackets is very limited except for public assistance cases.

Such income declarations should probably be filed at least semi-annually (except for farmers) and in addition at any time when major changes in the family's income status occur. Effective provisions will be needed for auditing and checking these declarations in order to minimize the temptation to understate the income. It is equally important, however, to minimize red tape and social stigma lest many families sorely in need of the program be kept from participating. The principle of self-certification should be adhered to as much as is administratively feasible.

Illegal Transfer of Coupons

The problems of enforcing proper use of the coupons are not new. The former food stamp program and war-time rationing have yielded considerable experience of how to meet these difficulties in preventing black market and other improper practices in handling coupons. Since participation would be entirely voluntary, and since families would actually pay out money for the coupons and would become more keenly aware of their need for more and better food, the incentive to profit from selling the coupons would likely be rather weak. They never could be sold for more than their face value, and probably would have to be offered for considerably less before buyers could be found.

Another illegal transfer of coupons would occur if retailers would accept coupons for soap and other non-food goods, or would sell any kind of food for coupons earmarked for specific foods. A certain amount of such abuses is probably inevitable. The question is whether they would reach such proportions as to endanger the program as a whole by undermining the integrity of participants and dealers.

In general these enforcement problems, though they must be met effectively, are not judged by competent experts to be unmanageable. Inspection, penalty, and other enforcement procedures used in the past in similar situations could be improved and should prove adequate to handle the corresponding aspects of the food allotment program.

Application to Farm Families

The program in rural areas would present some special problems. Farm families—and many other rural families—should be expected to produce some of their own food. This means that their allotments should be smaller than in urban areas in terms of the per capita value of coupons for food purchases.

This immediately presents a difficult problem, because it is not easy to throw all farm families in one group. Some produce 20 percent, others 80 percent of their own food. The percentage varies widely between regions, types of farming, and even between individual families.

In principle each farm family should be encouraged to produce as much of its own food as can be done economically. Some standard would have to be determined at the start based upon the

amount of food an average farm family in a given region is normally producing for home use. For the whole United States, that amount is about 60 percent. Hence, farm families might be entitled to buy 40 percent of the food allotment in coupons. For instance, a farm family might become eligible if its per capita *money* income should fall below $2\frac{1}{2}$ times that adjusted allotment value. If the food allotment in the region were \$170, a farm family could buy \$68 worth of coupons (40 percent of the basic allotment) if its per capita money income were less than \$170 ($2\frac{1}{2}$ times 68). This is only one of several possibilities for adjusting food allotments and their prices to the peculiar condition of farm families.

As experience is gained in administering the program in rural areas, more detailed information would be obtained from rural families about the food they are producing and the food they should be producing. The county agricultural agents and the State extension services could help in reviewing rural applications and determining how much food each family could be expected to produce.

In conclusion a comment on general strategy in economic policy is offered. Much has been made of the over-supply of labor in agriculture and of the need for shifting workers from farms into other occupations. If other sectors of the economy were under-supplied with labor relative to the effective demand, economic policy should indeed be directed to implementing such a transfer of workers into under-manned industries. But as long as millions of non-agricultural workers fail to find employment, an aggressive policy to shift workers out of agriculture can hardly be justified.

The interest of national welfare calls for promoting full employment simultaneously in industry and agriculture. For many years to come we shall do well if we can keep industrial employment opportunities in step with the normal farm-city migration which has kept the farm population nearly constant during the last three decades. If industry should be able to absorb, in addition to the urban labor force, a higher annual rate of farm-city migrants, public policy certainly should encourage and offer guidance to such migration. In the meantime increasing the utilization of the present farm labor force can result only in a net gain to general welfare.

The Food Allotment Program would substantially increase the effective demand for many farm products above what it would be without the program and would therefore help to reduce under-employment in agriculture and to increase national income.

ECONOMIC FUNCTIONS AND UNITS IN FARM ORGANIZATION*

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ONE of the more basic assumptions in our farm management research and teaching has been that the farm is an indivisible organization. All farm functions have been thought of as being under a central control and as being performed by a single organization. Even the home has been treated as an integral part of the farm. There would appear, moreover, to have been justification for this viewpoint in many situations, at least as far as description is concerned. In these situations the deviations from the centralized farm organization have been minor, and description logically reflected that fact. It has been common enough to be labeled as the traditional American farm organization.

The objective of this paper rests on the observation that in certain agricultural situations the farm is not an indivisible organization. Different functions are performed by different agencies. If this proposition is true, some important changes may need to be made in our farm organization studies. However correct current theory and practice may be as to the traditional farm with its indivisible characteristics, a different approach may be desirable where functions are separated. It is suggested here that the proper approach is through the individual function. In fact, the function may be the elementary field for all farm organization research. Only where the various functions cannot be separated is it necessary to combine them initially. It is also suggested that this functional approach will enable us better to keep abreast of technological developments and possibilities and to include more varied types of organization in our purview.

I

Economic functions will be regarded in this paper as the characteristic processes or activities of a factor of production. A factor of production may be one of the broad categories like land or it may be as specific as a tool. The functions of a factor are found in its relationships with other factors. The relationships which economists find of primary interest are such as have to do with choice,

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proportions, forms of control, and the effect these have on costs and income.

To a great extent functions are identical with what are called, "farm operations." In addition, however, there are the other processes or activities of farm organization such as management, investment, income distribution, and residence. The choice to be made, for instance, among various alternative investments, whether of land, of enterprises, or of equipment is a most important function for management and capital.

A first reaction may well be that this definition of functions is too broad and inclusive. It may, for instance, be thought to include what usually has been regarded as factor analysis. A description of a factor as a thing alone is not, of course, an economic matter. Such a subject is necessarily purely physical. A factor has economic interest only in its relationships to other factors. These relationships, in so far as they are economic, are here called functions. All such functions as found in farm organization make up the economic life of the farm. Some may appear relatively simple as in the choice of power for plowing. Other functions may be more complex as in the distribution of income. All, however, should be regarded as functions.

The concept of economic unit refers to the proportional or size relationships between factors. Analysis of the concept is pertinent here because independence among functions brings about differences between them in the size of economic units. For most farm operation in the central states, for instance, land may be economically divided into 320 acre units; but for threshing several times that acreage is more common and more economic. Once a function is found to be independent of others, it is no longer possible to assume that its economic unit is correlative with the other functions or with the farm in general.

II

To develop a complete list of the functions to be found in any farm organization would require more detail than is practical here. The following list of functions to be found in the citrus industry is incomplete but will serve to illustrate the proposition further:

- Investment (as a process)
 - in land
 - in equipment

Management activities
Employment
Residence
Soil management
Pest control
Supply of water
Application of water
Pruning
Marketing

To a very great extent each of these functions is independent of the others. To understand how this is so a sharp distinction must be drawn between ownership and farm operation. (Citrus orchards, incidentally, are seldom rented.) Anyone who performs one of the farm operations is an operator.¹ While industry usage often is not so broad, the term, operations, will be regarded as including such activities as marketing and water supply. An owner who does not perform these operating functions cannot be regarded as an operator even if he be a resident. He may more or less oversee the work of certain operators but that is a management function and is regarded as distinct from either the ownership or operating functions. Operators may or may not own land.

In areas where holdings are small, soil management is typically contracted to custom operators. The situation is even more extreme in pest control work in which only the largest growers do their own work. Typically it is done by specialized organizations which may be either private or cooperative. These operators own the equipment required; thus ownership of land and of equipment are independent functions. The supply of water and its application are usually distinct as to organization. Water supply organizations usually serve areas of some size in which cases the application of water when not done by the individual grower will be handled by an individual or organization with no connection with the supplier of water. A large proportion of pruning even on large holdings is done by contract. Marketing as is well known is also carried on by contractors, chiefly cooperative. Except in one county, almost none but the largest growers even pick their own fruit. The various operations thus are carried on by independent individuals or or-

¹ This definition differs from that of the Bureau of the Census. See United States Department of Commerce Bureau of the Census. *United States Census of Agriculture*, 1934. Vol. 1: p. VI. 1936.

ganizations whose mutual interest is very apt to be limited to their ultimate control by common landowners, to their desire to reduce conflict in timing field operations, and to their dependence on joint sources of income. Many pest control and marketing organizations are relatively so influential that some landowners have little more than a consultative capacity in operations on their own land. Even where the owner is active in management, he uses several distinct organizations or contracting individual specialists to do much of his work. The fact that ultimate control of all functions resides in the landowner does not lessen the day to day independence of the operators. The prerogatives and responsibilities of management are distributed and are not tied to one factor alone.

Ownership often bears more resemblance to stock ownership than to traditional farming. An individual's interests are often widely scattered. As is common in urban affairs, investment is more influenced by sound investment practices such as the need for diversified holdings than by one's ability to successfully operate a given property. Operating efficiency is maintained because the operations are cared for by specialized agencies whose activities conform not to rules of investment but to sound operating practices. It may be extreme to say that efficient operation is independent of wise land investment, but many buyers certainly make that presumption.

The position of agricultural labor in this situation is not that found on the traditional American farm. The great mass of them are hired by the operating agencies, particularly the packing houses. The relationship of most such men to their employers appears to be identical with that in urban industry. This relationship is peculiarly true with respect to family labor. The industrial relationship discourages participation by the family. On the other hand proximity to other industries both urban and agricultural and to other operations in citrus offers the family widely dispersed opportunities for employment. This family situation holds for landowners and operators as well as for employees.

Residence in the citrus industry is also at variance with the traditional concept of farming. Living on the land is no longer an agricultural prerogative. Many residents in the country are dependent on urban incomes while many agricultural people live in town.² Also many purchasers of citrus property view residence as

² George M. Peterson, *Composition and Characteristics of the Agricultural Population in California*. California Agricultural Experiment Station. Bul. 630. 1939.

the chief reason for their investment. The orchard is merely an adjunct to a nice home.

Several years of rather close observation has convinced me that residence, ownership, employment, and individual orchard operations are independent to a remarkable degree. A person's situation as to one function is not particularly informative as to his situation with the other functions. Even though ultimate control resides in land ownership, the key men in the communities are the operators. They have the know-how, make most decisions, and carry out the decisions. They employ the mass of laborers. Since their interest and activities are essentially one of service to others, their viewpoint is much more like that of business men than that of farmers.

III

Statistical evidence in support of the above description waits on surveys which are beyond the facilities available. The situation should not be thought of as universal or perhaps even as most common, but it is usual enough to have a prominent place in the industry. A description of holdings is, of course, available in the census. The reader is doubtless aware of the information published about the principal marketing organizations. Less well known but very thorough are the descriptions of the water supply systems.³

Very little is known about the other functions. Yet an adequate knowledge of how farming is carried on requires information of how every function is performed.

While based only on casual descriptions, I suspect that citrus is not the only agricultural industry with characteristics such as have been described. The dominance of several operations by contract operation has been recognized only occasionally in formal studies.⁴ More information is needed. To suggest that an adequate description of agriculture requires information about a great number of functions may appear at first to require a great number of questions for a survey. This view is not necessarily true. The functions about which information is lacking and which involve contract

³ See, for instance: Frank Adams, *Irrigation Districts in California*. California Department of Public Works. *Report of the Division of Engineering and Irrigation*. Bul. No. 21. 1929; and James R. Tavernetti and M. R. Huberty, *A Study of Small Individual and Cooperative Pumping Enterprises in Orange County*. California Agricultural Experiment Station, Berkeley, 1936 (Mimeo.)

⁴ Roy J. Smith, "Fuller Annual Employment of Farm Labor," this JOURNAL. Vol. XXVI, No. 3, August, 1944.

relationships with all their labor use might well be covered if it were recognized that the typical operator, whether an individual or an organization, probably is a specialist and probably carries on an operation with no necessary relationship to land ownership. If his particular operation were treated as a business, which it usually is in every sense of the word, much of the needed information might be obtained easily. The special information needed from such people is simply types of operations and acreage handled for each type. If in addition information were gathered as to payrolls some of the present day inadequacy of information about labor in agriculture would be remedied.

IV

The independence of functions opens the way for great variety in organization. The scope of the possibilities cannot be thoroughly understood until it is realized that in some citrus areas the community is the real integrated unit for many operations. Few tasks are undertaken on the individual holding without reference to the control exercised by the larger group, the relative needs of associated holdings, and the desirable sequence of operations among them. The assumption in such situations that the holding is the agricultural unit has served to draw an inaccurate picture of the organizations and people involved.

The characteristics of individual holdings do affect, of course, the efficiency with which they are operated. Their size and location, for instance, obviously have an influence on the operator's efficiency. Such characteristics, however, more nearly resemble those one looks for in an individual field of the traditional farm than in the complete holding.

Relative operating efficiency in such circumstances is not chiefly a matter of differences between holdings. An analysis of costs on a ten acre holding is little more than a compilation of contract charges. The important differences are between operators and their various forms of organization. At any given time such differences are not at all sure to be revealed to the owner of an orchard because charges are largely standardized. In time the differences doubtless eliminate the less efficient, but an economic study of the competing elements is of little value when the discovery of the more efficient is dependent on the elimination of some operators through competition.

In our studies of the traditional farm there has been the thought not only that the economic unit in agriculture was correlative with the farm but also that it was rather specific in size. As such it would give the best return to the farmer. Forster, for instance, follows the generally accepted view when he says that the economic unit is, "that unit which utilizes to the fullest the available resources of the farmer, including his managerial ability."⁵

The suggested emphasis of individual functions would give freer rein to size analysis. The analyst would not be limited to the sizes found in a classification based on a particular farm type but could plan his study with reference to the one function alone. For such an analysis it would be best to define the economic unit as including all sizes for which examples of satisfactory operation could be found. Initially, moreover, mere existence of the examples could be considered as proof of satisfactory operation. It may be assumed that to the factors concerned the going practice represents what is to them the best alternative opportunity. Whatever may be said about the apparent standards of income, the criteria are certainly objective.

It is important that this *range* in size be accepted as the economic unit rather than any single figure, such as an average. The intent in describing the economic unit as a specific size, of course, is to ascribe to it the *most* economic size. Such usage may be correct when a specific farmer is in mind. This is particularly true if he has a given capacity and interest and has control of a given supply of capital and labor. Expansion or contraction of any factor may be difficult and thus his alternative opportunities may all be poorer. Such a situation, however, is in sharp contrast to the interest of this paper. For the analysis in mind here, it would seem to be incorrect to say that *the* economic unit for a type of farm is such and such a figure. Within any class there is invariably a range, and the general use of the concept of economic unit should reflect that fact. Moreover, as the many relationships are made less specific, the range of the economic unit must broaden.

Naturally the objective in cost analysis will be directed toward the determination of the most economic unit or at least the more economic units. As progress is made in any such analysis, the study tends to become more subjective; the influence of the analyst's

⁵ G. W. Forster, *Farm Organization and Management*, p. 351.

personal criteria becomes of increasing importance. As the various relationships are unfolded, a series of most economic units are discovered which may duplicate the range originally established as the economic unit.⁶

Income analysis naturally is tied to the specific factor. Many phases of such analysis, however, can best be approached as a function. Most people in citrus are specialists. By studying the particular operation or other function in which they are engaged many opportunities may be developed for effective analysis which might be missed in a direct investigation of income. My personal work in studying ways of stabilizing fruit picker's earnings has led me to develop this statement on the functional approach.⁷ These studies are devoted to fruit picking as one of the functions found in packing houses. As such it can be regarded as a simple efficiency study. The function of marketing can be broken down into more minute functions with consequent greater concentration for study. It is this concentration which makes functional analysis effective.

An additional point to be made for functional analysis is that it opens wider the possibility of bringing the economist into closer cooperation with the scientist and the engineer. There always has been an unfortunate hiatus between their respective fields of study. This cooperation would seem to be more feasible in functional analysis because then the economist deals with the particular fields of study that the others regard as their sole interest.

The information of the scientist and the engineer is relatively exact and wherever possible should serve either as a point of origin or as a check for the economist. The use of the engineer's data, for example, may extend or perhaps contract a given range for the economic unit. Lacking the proof of experience such extensions to the range may not merit the description of economic, but they certainly are potentially economic and as such justify the economist's attention. At the same time the engineer's concepts of efficiency would introduce a greatly improved understanding of what constitutes the more efficient sizes. On the other hand, development of functional analysis by the economist may enable the engineer and scientist to better understand the pertinence of their information

⁶ I have in mind a concept comparable to that expressed by A. G. Bressler, Jr., *Research Determination of Economies of Scale*, this JOURNAL, Vol. XXVII, No. 3, Aug., 1945. (Fig. 1, p. 527.)

⁷ Roy J. Smith, "The Tree Production System of Paying Lemon Pickers." *The California Citrograph*, Vol. 30, No. 12, October, 1945, pp. 374-375.

by providing a step toward analyzing it as a part of the entire business.

V

The reader is doubtless aware that in certain respects no new type of study is being proposed. Many studies have been made of what are here called functional analyses. Some have been referred to. Other subjects may be listed as those having to do with choice of power, with credit relationships, and with labor requirements.⁸ Most aspects of farm interrelationships might best be handled on a functional basis. It is of interest that the need for studies of this latter type has been noted even in areas where the traditional farm organization is dominant.⁹

What is perhaps new is the suggestion that functional studies be given a formal place in our farm organization work and that such usage will increase our opportunities in investigation. They should reveal many organizational possibilities which otherwise may be missed. In particular they offer an opportunity for detailed efficiency analysis without first making assumptions on organizational matters.

⁸ The following will serve as examples: R. L. Adams, *Seasonal Labor Requirements for California Crops*. California Agr. Exp. Sta. Bul. 623. 1938. L. A. Reynoldson, W. A. Humphries, S. R. Speelman, E. W. McComas, and W. H. Youngman, *Utilization and Cost of Power on Corn Belt Farms*. U. S. Dept. of Agr. Tech. Bul. 384. 1933. P. S. Eckert and J. I. Falconer, *Characteristics and Cost of Short Term Farm Loans Made by the Ohio Country Banks*. Ohio Agr. Exp. Sta. Bul. 633. 1942.

⁹ See W. W. Wilcox, S. E. Johnson, and S. W. Warren, *Farm Management Research, 1940-1941*. Social Science Research Council. Bul. 52, 1943. p. 55.

BENEFITS FROM IRRIGATION UNDER SUB-HUMID CONDITIONS

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THERE is considerable current interest in proposals for irrigation developments in sub-humid areas. Of particular importance are those proposals for irrigation of the Willamette Valley in Oregon and of the eastern portion of the Missouri River Basin.¹

These areas are termed "sub-humid" because the natural precipitation in them is sufficient to permit agricultural development without irrigation, but both areas are subject to precipitation limitations that prevent the fullest utilization of the land.

The precipitation deficiencies of the two areas are not alike (fig. 1). The Willamette Valley is characterized by a high annual rainfall with an exceedingly small summer precipitation. The year-to-year variation in total precipitation is not a serious problem. The Missouri Basin, on the other hand, has a lower annual rainfall but receives a considerable portion of its yearly total during the summer months. The more serious problem here is that caused by the years of extreme drouth.

The areas are alike in that in both the great bulk of the irrigable land is now in private ownership and is devoted to agricultural use. Irrigation development, if it takes place, must do so within this framework of private ownership and the present state of agricultural development.

This article is based on the author's experience in the Willamette Valley.² References are made to the Missouri River Basin because it is felt that certain of the principles pertain to the more humid portions of that area also.

* This paper presents the personal viewpoint of the author and is not an official statement of the U. S. Dept. of Agr. The author acknowledges helpful criticisms given by H. E. Selby, Marion Clawson, W. U. Fuhrman, and D. Curtis Mumford.

¹ The Bureau of Reclamation has proposed in a report entitled *Conservation, Control, and Use of Water Resources of the Missouri River Basin*, May 1944, that 4,760,400 acres of presently nonirrigated land in Mont., Wyo., Colo., N. D., S. D., Nebr., and Kan. be supplied with irrigation water.

² During the past year, the author worked with representatives of Oregon State College and the Soil Conservation Service on a study of irrigation in the Willamette Valley, Oregon. The results of a part of this study have been published in Oregon Agr. Expt. Sta. Circular 168, *The McKenzie and Muddy Creeks Irrigation Projects*, June 1945. A report entitled *Probable Benefits from Irrigation of Valley-Floor Soils in the Willamette Valley, Oregon* is now in manuscript form.

Present Status of Irrigation

In 1939, in the 9 counties within the Willamette Valley, only 27,205 acres were irrigated or only 2 percent of the cropland and plowable pasture within all the farms of the area.³ In the Missouri River sub-basin, Fort Peck to Sioux City, in which the current development plans call for the irrigation of 2,292,900 acres of land,

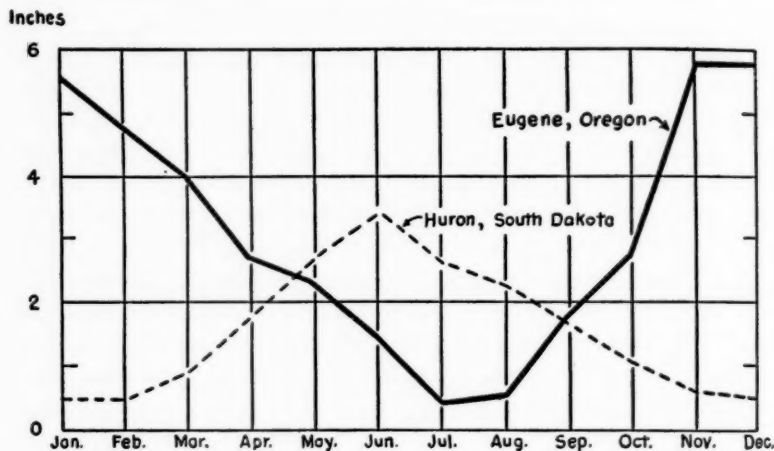


FIG. 1. AVERAGE MONTHLY PRECIPITATION, HURON SOUTH DAKOTA, AND EUGENE, OREGON, 40-YEAR PERIOD. DATA FROM *Climate and Man*, U. S. DEPT. OF AGRICULTURE YEARBOOK, 1941.

only about 29,500 acres presently are irrigated in an area comprising a total of 47,232,000 acres.⁴

In the Willamette Valley, most of the present irrigation development has taken place in two fields: (1) truck crops on the river-bottom soils and (2) Ladino pasture on the older, heavier valley-floor soils. The pattern of this development is brought out in data from 39 farms in Yamhill County, Oregon (Table 1). Twenty-four of these were situated primarily on the valley-floor soils. These soils are older in a geological sense, are no longer subject to stream overflow at flood time, and have in general a fairly heavy texture. Fifteen farms were situated on river-bottom soils. These are the

³ *Census of Agriculture*, 1940, Vol. I, Part 6, page 620, and *Census of Irrigation*, 1940.

⁴ *Conservation, Control and Use of Water Resources of the Missouri River Basin*, op. cit., page 121.

newer soils. Many of them are still subject to periodic overflow and all of them are characterized by much lighter and more friable soil material.

TABLE 1. IRRIGATED AND NONIRRIGATED LAND USE BY KIND OF SOIL,
39 FARMS, YAMHILL COUNTY, OREGON, 1944¹

Land use	24 farms on valley-floor soils		15 farms on river-bottom soils	
	Total acreage	Proportion in each use	Total acreage	Proportion in each use
	<i>Acres</i>	<i>Percent</i>	<i>Acres</i>	<i>Percent</i>
Irrigated:				
Hay	127	5.1	36	2.5
Grain	24	1.0	4	0.3
Silage	10	0.4	1	0.1
Intensive cash crops	18 ²	0.7	173 ³	11.6
Extensive cash crops	0	0.0	55 ⁴	3.7
Orchard	3	0.1	0	0.0
Pasture, Ladino, and grass mixtures	181	7.2	71	4.8
Total irrig. cropland	363	14.5	340	23.0
Nonirrigated:				
Hay	435	17.3	296	20.0
Grain	570	22.7	282	19.1
Silage	59	2.4	28	1.9
Intensive cash crops	0	0.0	5 ⁵	0.3
Extensive cash crops	169 ⁶	6.7	62 ⁷	4.2
Orchard	1	— ⁸	4	0.3
Fallow	3	0.1	10	0.7
Cropland pasture	36	0.5	56	3.8
Permanent plowable pasture	29	1.2	5	0.3
Total nonirrig. cropland	1,302	51.9	748	50.6
Noncropland uses:				
Perm. pasture, nonplowable	154	6.1	87	5.9
Woods	548	21.9	243	16.4
Farmstead and waste	140	5.6	60	4.1
Total noncropland uses	842	33.6	390	26.4
Total land in farms	2,507	100.0	1,478	100.0

¹ Data courtesy of the Farm Security Administration.

² Beans.

³ Includes beans, berries, broccoli, cauliflower, potatoes, spinach, sweet corn, tomatoes, cabbage and beet seed.

⁴ Flax.

⁵ Includes rhubarb and berries.

⁶ Includes field peas, flax, vetch, clover seed.

⁷ Includes field peas, fescue, sudan seed.

⁸ Less than 0.05 percent.

It will be noted that of the acreage irrigated on the 24 farms on valley-floor soils, half was in Ladino pasture and an additional 35 percent was in hay. Canning beans were grown on only 18 acres of the 363 acres irrigated on these 24 farms. On the other hand on the 15 farms located on the more friable soil intensive cash crops represented half of the acreage irrigated. This same situation was found on farms in the McKenzie Irrigation Association in Lane County, Oregon. A survey of 54 farms on the valley-floor soils revealed only 49 acres in irrigated canning crops in 1944, although there was a considerable acreage of such crops on adjacent river-bottom soils.

These differences between the two major types of soil are important because much of the projected irrigation development of the Willamette Valley involves valley-floor rather than river-bottom soil.

The two crops, Ladino pasture and truck crops, that have gained widest acceptance among irrigation-minded Willamette Valley farmers are alike in one respect. Both make much of their growth during the summer months of July and August, and their culture without irrigation is virtually impossible. There is some irrigation of hay and other crops that long have been grown in the Willamette Valley without irrigation, but as yet this practice has not gained wide acceptance by farmers of the area.

Probable Development

In both the Willamette Valley and the eastern portion of the Missouri River Basin the present irrigation is so limited in extent that the problem of forecasting the eventual crop patterns, should irrigation water be made available generally throughout these areas, is difficult. It is significant that in neither area has private development proceeded very far in providing irrigation water. This is in contrast to the situation in the 11 Western States where private development was responsible for nearly 90 per cent of the 18.5 million acres irrigated in 1939.

In the Willamette Valley there were 4,000 acres irrigated in 1929 and 27,000 acres in 1939, according to census statistics. Several persons who are well informed as to irrigation in the area have estimated that by 1944, some 50,000 acres were irrigated. Data are not yet available from the 1945 Census of Agriculture to check the validity of this estimate. This development represents a spectacu-

lar rate of increase and has led some persons to feel that the entire valley will soon be in irrigated agriculture. It is well to note that even if the estimate of 50,000 acres irrigated in 1944 proves correct, this acreage represents less than 8 percent of the estimated 659,000 acres of irrigable land⁵ in the valley. Thus the recent development, spectacular through it seems, represents only a small portion of the irrigable land area. Some opportunities for further private development still exist. Particularly is this true of the river bottom lands where water may be obtained by pumping from shallow wells. However, most of the better sites for obtaining surface water have now been developed. Additional irrigation of large areas will require larger expenditures than was true on much of the present development and if carried out will probably require governmental financing.

Farms with irrigation water have been slow to use it. Of 54 owners of shares⁶ in the McKenzie Irrigation Association in Lane County, Oregon, only 47 reported irrigation in 1944, and they irrigated only about 85 percent of the acreage for which they were entitled to water. In the Muddy Creeks Irrigation Project in Lane and Linn counties, Oregon, shares were outstanding for 3,000 acres, but only about 800 acres were irrigated in 1944. These data, sketchy though they are, indicate a reluctance on the part of farmers to change their established way of farming.

In spite of this paucity of information, a decision must be reached as to the acreage that is likely actually to be irrigated under these projected developments before they can be appraised accurately. In the Willamette Valley this would probably take the form of an estimate of the portion of the irrigable land that would be devoted each year to irrigated crops as against the proportion in nonirrigated uses. In the Missouri River Basin, it might be an estimate of the proportion of the land that would be irrigated over a period of years since it seems highly probable that in some wet years there would be little demand for water whereas in dry years the demand would be high.

The present type of farming must be recognized in considering the degree to which water will be put to use voluntarily. It has

⁵ Report of the U. S. Engineers, House Document No. 544, 75th Congress, 3d Session, page 73.

⁶ Each share of stock entitled the holder to irrigate one acre of land with water from the Cooperative's ditches.

been pointed out earlier in this article that in both the Willamette Valley and the Missouri Basin, the potential irrigable land is largely privately owned and presently employed in an agricultural use. The introduction of large-scale irrigation projects may require many changes in the basic types of farming. Particularly will this be true of those farms that are now devoted to large acreages of extensive crops such as small grain and grass seeds.

Most of the area in Linn County, Oregon, served by the Muddy Creeks Irrigation Project is in large grass-seed farms. The average size of 16 farms on which irrigation was practiced in 1944 was 456 acres per farm. The acreage irrigated per farm was only 30 acres or about 7 percent of the cropland. Many other farms in the area own shares in the irrigation venture but practiced no irrigation at all in 1944. This can hardly be called irrigation farming and certainly would not justify the construction of projects estimated to cost from \$100 to \$200 per acre of irrigable land.⁷ The Muddy Creeks Project represents an original investment of only \$10 *per share* and an operation and maintenance cost of \$1.50 per share per year.⁸ Each share permits the irrigation of one acre, although, as was pointed out, only 800 acres were irrigated in 1944 by the holders of 3,000 shares of stock.

Farmers on the Muddy Creeks Project have in effect applied water to a small acreage of land while maintaining their basic seed-crop type of farming. They have not introduced irrigation to the degree that will be necessary to support the construction costs contemplated in current irrigation proposals. For them to do so would require changes in their type of farming. This they have been reluctant to do because their present seed-crop farming has proved profitable under the large-scale methods followed. If a 400-acre seed-crop farm were subdivided into 4 or 5 irrigated dairy-farm units, a greater total return would result. The division of this return among the larger number of operators would, however, result in a smaller return per operator, assuming other costs are met at the standard rates. Thus, under present conditions, the operator of a 400-acre seed-crop farm in Linn County, Oregon, has no incentive to go into intensive irrigation. The degree to which a like

⁷ Costs as high as this were reported for several Willamette Valley projects in a news item in *The Oregonian*, April 13, 1945.

⁸ These are the Project costs. A number of farms had additional costs for distribution of the water from the Project ditches, mainly for pumping and for pipe and sprinkler systems. See *Oreg. Expt. Sta. Circ. 168*, op. cit., p. 26.

situation prevails among the grain farmers of the Missouri Basin should be investigated.

The author does not wish by this discussion to leave the impression that the Willamette Valley is an area of large farms. Actually the majority of farms there are small, the average size as reported by the 1940 Census of Agriculture being 89 acres. Even on the smaller farms many changes will need to be made in present farm organization and in cropping practices if the degree of irrigation contemplated by some is realized. Much of the planning of current irrigation proposals is based on the assumption that "80 percent of the irrigable lands will be irrigated in any one year."⁹ On very few of the farms studied in the Valley was this percentage realized. On 18 dairy farms in the McKenzie Irrigation Association, only 28 percent of the irrigable cropland was irrigated in 1944. About this same percentage of cropland was irrigated on the farms in Yamhill County previously referred to (Table 1).

Crop Yield Data

In studying benefits from irrigation under sub-humid conditions one of the difficulties encountered is the lack of data on crop yields that may reasonably be expected with irrigation. The amount of irrigation in these sub-humid areas is so small that few data are available and some of them are in conflict. Table 2 summarizes yield data on clover hay grown under Willamette Valley conditions.

It will be noted that widely differing yields are reported. These differences merit some discussion. The average yield of 6.25 tons per acre as reported in Oregon Agr. Expt. Sta. Bulletin 302 represents a 25-year summary of all irrigation trials conducted by the Department of Soils of that institution. In the nonirrigated control plots, the average yield over the 25-year period was 4.17 tons. Irrigation resulted in a 50 percent increase in yield. In another series of trials, reported in Bulletin 394, Powers and Lewis obtained average yields over a 4-year period of only 0.86 ton per acre nonirrigated, and 1.15 tons irrigated. Prof. Powers has indicated that this land was leased by the College for the experiments and was "weedy and not very well levelled."¹⁰ The results of the 4-year trial are shown in Table 2 simply to indicate that irrigation will not bring

⁹ *Land Development in Oregon through Flood Control, Drainage, and Irrigation*, Oregon State Planning Board, July 1938, page 123.

¹⁰ Letter dated Oct. 8, 1945 addressed to D. Curtis Mumford.

TABLE 2. COMPARISON OF YIELD DATA FOR CLOVER HAY,
WILLAMETTE VALLEY, OREGON

Source of data:	Period	Yield of clover hay		Increase due to irriga- tion	Increase as a per- cent of dry yield
		Dry	Irrigated		
		<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Percent</i>
1. Experimental studies:					
Bull. 302 ¹	1908-1932	4.17	6.25	2.08	49.9
Bull. 394 ²	1936-1939	0.86	1.15	0.29	33.7
2. Census data: ³					
Nine Valley Counties:					
Clover and Timothy					
hay	1939	1.7	1.9	0.2	11.8
Annual legume hay	1939	2.0	2.9	0.9	45.0
3. Farm surveys:					
Irrigation study: ⁴					
McKenzie area	1944	1.9	2.5	0.6	31.6
Muddy Creeks area	1944	1.5	2.0	0.5	33.3
Bull. 248 ⁵	1925-1927		2.0		
Willamette Valley study ⁶	1938				
Land class I			2.2		
Land class II			2.3		
Land class III			1.7		
Land class IV			1.6		
Willamette Valley study ⁶	Usual				
Land class I			2.2		
Land class II			2.6		
Land class III			1.9		
Land class IV			1.5		
4. Estimates:					
Farm Security Borrowers ⁷	1944	1.9	2.3	0.4	21.1

¹ W. L. Powers, *Twenty-Five Years of Supplemental Irrigation Investigations in Willamette Valley*, Oregon Expt. Sta. Bull. 302, June 1932, p. 15.

² W. L. Powers and M. R. Lewis, *Irrigation Requirement of Arable Oregon Soils*, Oregon Expt. Sta. Bull. 394, June 1941, p. 28.

³ *Census of Agriculture*, 1940, Vol. I, Part 6, pages 665-674.

⁴ Alexander Joss, et al., unpublished data from the Willamette Valley Irrigation Study, 1944.

⁵ H. E. Selby, *Cost and Efficiency in Producing Hay in the Willamette Valley*, Oregon Expt. Sta. Bull. 248, May 1929, page 9. Yields apply almost entirely to nonirrigated hay.

⁶ D. C. Mumford and Orlo H. Maughan; unpublished data from the Willamette Valley Farm Survey made in 1939. Yields apply almost entirely to nonirrigated hay.

⁷ From tabulation of Farm Plans of 24 farm operators on Land Class 2 in Yamhill County.

beneficial results under unfavorable conditions. And it must be recognized in planning a large scale development that there will be some farmers who will not do a fully satisfactory job of irrigating.

The Census of Agriculture provides some data on yields under

irrigated and nonirrigated conditions. A very small difference was found between the irrigated and nonirrigated yields for "clover and timothy" hay. For comparison the yields as reported for "annual legume hay" are also shown.

In the irrigation study data were obtained on irrigated and non-irrigated clover hay yields. The data, particularly for irrigated yields, are based on a rather small acreage because of the limited amount of irrigation practiced. They are, however, among the few data available that show the experience of farmers with irrigation. For comparison, the yields of hay as found in two other studies are given. These studies did not separate irrigated from non-irrigated yields but from the known distribution of the acreages grown under each condition it may be assumed that the yields were based mainly on nonirrigated clover hay. Particularly was this true in the 1925-27 period reported in Bulletin 248.

The farm plans in the files of the Farm Security Administration contained the farmer's estimate of his probable 1944 yields. These data are presented under the heading of "Estimates" since they do not purport to show the yields actually received.

It is of interest to note that the Census, survey, and FSA farm plan data all show average yields for nonirrigated clover hay within a range of 1.5 and 2.6 tons per acre and that the yields with irrigation are from 12 to 33 percent higher than without it. It is known that these data are meager. A real need exists for more data showing the results that may be expected from irrigation carried on under farm rather than under experimental conditions. This is said, not in criticism of the experimental results, but simply because it is the author's conviction that the average yields obtained by any large group of farmers will be smaller than yields obtained by scientists conducting carefully planned experiments.

Clover hay was used as an illustrative crop in table 2. There is even less information about yields of some of the other crops that might be grown with irrigation under Willamette Valley conditions. Experimental data for alfalfa, potatoes, beans, corn, kale, beets, and fiber flax indicate yield increases due to irrigation of from 32 to 61 percent.¹¹ There are very few data to indicate whether farmers can obtain these same responses under farm conditions.

In view of the limited amount of irrigation in the eastern portion

¹¹ W. L. Powers, *Twenty-Five Years of Supplemental Irrigation Investigations in Willamette Valley*, Oregon Agr. Expt. Sta. Bull. 302, June 1932, p. 15.

of the Missouri Basin it is to be expected that investigators there will likewise be confronted with a lack of data as to what crops respond to irrigation and the extent of their response.

In spite of this lack of information on crop yields, some estimates must be made as to probable crop responses with irrigation if the current proposals for irrigation development are to be appraised accurately.

It is the author's opinion, taking into account the available data on yields, the length of the growing season, and the difficulties of handling hay crops under Willamette Valley conditions,¹² that yields of clover hay with irrigation may be expected to average 3.0 to 3.5 tons per acre. Since yields without irrigation average 2.0 to 2.5 tons per acre, the increase due to the irrigation would be about a ton per acre. In the arid regions of the West, hay yields of 3.0 to 3.5 tons per acre are not uncommon with irrigation. Hay yields without irrigation are practically nil. Virtually the entire production represents the new product resulting from the irrigation. Thus by comparison with these arid regions, the physical increase in product which will result from irrigation development in the Willamette Valley will be small.

Calculation of Benefits

Benefits from irrigation arise only through the increased product which the irrigation water makes possible. Benefits may thus be large or small, depending upon crop responses. They tend to be highest in extremely arid regions and to approach zero in areas where the rainfall approaches optimum moisture needs. The reason for calculating benefits is to provide a bench mark with which the costs of the proposed irrigation development may be compared. A proposal is considered feasible only if the benefits exceed the costs. On this point there is virtually universal agreement. There is disagreement, however, as to the methods to be used in the calculation of benefits.

Before discussing these methods it is appropriate to consider the different kinds of benefits that may arise from an irrigation development.¹³ Among irrigation economists the three terms, (1)

¹² In some years rain in the month of June interrupts hay harvesting and results in considerable loss.

¹³ The same kinds of benefits would arise from other undertakings, as for example a drainage project or a flood control project.

direct, (2) *local indirect*, and (3) *national indirect* benefits have come to have rather general usage. *Direct* benefits are those which accrue to the farmers using the water. *Local indirect* benefits are those which accrue to persons or corporations in the vicinity of the project and arise out of the increased production of the newly irrigated area. For example, a railroad company already serving an area might gain an appreciable volume of new business that could be handled with little or no increase in facilities and overhead cost and only slight increase in operating costs. *National indirect* benefits are those benefits which accrue to the nation as a whole. The one most commonly referred to is the provision of an increased food supply for our continually increasing population.¹⁴

The calculation of the benefits from irrigation has presented many problems and neither of the two methods in general use has solved these adequately.

The method most widely used by the Bureau of Reclamation assumes that the gross value of the increased crop output resulting from the irrigation development measures the total benefits. Thus in its report on the Missouri River Basin, this agency estimated the annual benefits from supplying water to 4,760,400 acres of presently nonirrigated land and 547,304 acres of presently irrigated land needing additional water at \$130,000,000 annually. This is approximately \$25 per acre of all land to be benefited. The benefits from irrigation as thus calculated account for 77 percent of the total benefits from the proposed development.¹⁵

The general theory underlying this method is that the entire increase is represented in payments to the factors of production. Thus, if through irrigation an additional ton of hay worth \$10 is produced on an acre of land, the entire sum will be used to pay land, labor, capital and/or management, depending upon the particular circumstances. To the proponents of this method the entire \$10 is income to some person or thing. This theory would seem to have validity only if there were no alternative uses for the factors of production involved in creating this additional ton of hay. It

¹⁴ For a fuller discussion of indirect benefits, see an article by H. E. Selby, entitled "Indirect Benefits from Irrigation Development" in the *Journal of Land and Public Utility Economics*, Feb. 1944.

¹⁵ The high benefits from irrigation account in large measure for the favorable cost-benefit ratio of 1:2.57. It is interesting to note that the anticipated irrigation repayments represent only 24 percent of the estimated total cost. For additional details see *Conservation, Control and Use of Water Resources of the Missouri River Basin*, op. cit., pp. 9-12.

seems highly improbable that a situation will ever arise where no alternatives are present. To the extent that alternative opportunities are present, they represent costs which must be considered if a fair appraisal of the net benefits of the irrigation development is to be attained.

This method of calculating benefits is subject to other weaknesses. It does not measure the benefits accruing to the different classes of beneficiaries and consequently cannot be of use in the difficult problem of allocating the cost of the project development among the beneficiaries. Another disadvantage is that no internal check is provided against an unwise choice of the crops to be grown on the projected development. The door is open to the use in the calculation of crops with high gross values per acre. The addition of a few acres of orchard or truck crops to the calculation can result in a material increase in gross value of product. This increase is meaningless unless the additional costs of producing the more intensive crops are considered.

In referring to this last point, the author is not implying that benefits have been "padded" through the use of crops not adapted to the areas being considered in the benefit calculations. However, the investigator who uses the gross value method has no check upon his work and may be guilty of including high value but non-profitable crops in his computations without realizing his error.

The other method in general use has attempted to determine the benefits accruing to the specific beneficiaries and thus approximate the total benefits. This method is subject to the specific criticism that no appropriate means has as yet been worked out to measure the amount of national benefits. Direct benefits are measured by deducting from the gross increase occasioned by the irrigation all the costs of obtaining the increased product except the cost of the water. The direct benefits thus represent the maximum that the irrigator could pay for the water.

To the direct benefits must be added the benefits which accrue to the indirect beneficiaries. The quantitative measurement of these is much more difficult. A measure of local indirect benefits is found in the relationship of the values of farm and nonfarm lands. A study of data from Imperial County and from the Central Valley counties in California indicated a fairly consistent relationship between the value of the two classes of land. From these data it was concluded that the local indirect benefits would approximate 25

percent of the direct benefits.¹⁶ No attempt was made in the study to measure quantitatively the national indirect benefits. There is a real need for such a measure.

Amount and Incidence of Benefits

Regardless of the method used, the benefits from new irrigation development in the Willamette Valley, Oregon, are apt to be small compared with benefits that have been realized from the irrigation of lands in some of the more arid sections of the West.¹⁷ This is due primarily to the fact that the area produces rather high yields of many crops without irrigation. The possibilities for increased production with irrigation are limited.

Because of the relatively high growing season rainfall in the eastern part of the Missouri Basin, it would seem that a somewhat similar situation might well exist there.¹⁸

Although beneficiaries may be classed broadly as direct, local indirect, and national indirect, the particular persons or groups of persons who finally gain the maximum net benefit from a new development depend upon numerous factors. It would appear that some of these factors may be different in sub-humid from those in arid areas.

On some of the early irrigation developments in the arid regions the direct benefits were considerably higher than the cost of the water. Thus a net benefit arose when the water was applied to the land. A landowner who obtained water at cost found that he made a higher return from his land with irrigation than without it. This led naturally to an increase in value of those lands that could be served with water. Expressed in other words, the net benefits from the irrigation development were *capitalized* into land values. As more costly developments arose, a smaller and smaller net benefit remained to be capitalized into land values. Many persons failed to recognize this, however, and a strong feeling developed that land that could be irrigated was inherently "worth more"

¹⁶ H. E. Selby, op. cit., p. 51.

¹⁷ In a press release from Sacramento, Calif., dated Oct. 5, 1945, the Bureau of Reclamation indicated that the provision of water to 3,040,000 acres of land in the Central Valley of California would return annual benefits of \$197,880,000, or approximately \$65 per acre. This figure would compare with the \$25 per acre for the Missouri River Basin previously mentioned in this article. The Bureau has not released its report of benefits from irrigation in the Willamette Valley, Oregon.

¹⁸ The average growing season precipitation (April-Sept. inclusive) at Huron, South Dakota is only 1.04 inches less than at Buffalo, New York.

than surrounding dry land without a water supply. Situations arose where a portion of the benefits that should have gone to pay water charges was being capitalized into land values. Settlers were paying such high prices for land in irrigation developments that they had insufficient income left to pay water charges after they had paid interest on these high land costs and had paid their living expenses. The inevitable result was that the water charges were not paid, and many irrigation developments have records of defaults on their obligations.¹⁹

In an attempt to prevent the capitalization of benefits into land values on Bureau of Reclamation projects, legislation was first enacted in 1926 providing that on new projects or new divisions of projects, "... all irrigable land held in private ownership by any one owner in excess of one hundred and sixty irrigable acres shall be appraised in a manner to be prescribed by the Secretary of the Interior and the sale price thereof fixed by the Secretary on the basis of its actual bona fide value at the date of appraisal without reference to the proposed construction of the irrigation works:..."²⁰ Similar legislation applying to certain specific projects has since been enacted. The effectiveness of these laws has not yet been studied adequately.

However, it must be observed that unless a portion of the benefits is permitted to accrue to the present landowner, there is no incentive for him to undertake irrigation. And yet the history of irrigation development in this country indicates that if a portion of the benefits is permitted the landowner, sooner or later it will be capitalized into land values. Thus the incidence of this portion of the benefits would rest with present landowners.

There appears to be one difference between the arid areas and the sub-humid areas that may influence markedly the amount of the benefit which must thus accrue to the existing landholder in order either to induce him to irrigate his land or to sell his land to a prospective irrigator. This difference is in the value of the non-irrigated land.

In the arid regions privately-owned range land has generally been valued at from \$1 to \$5 per acre and rarely at more than \$10 per acre. If only five cents per acre of the annual benefits accrues to the

¹⁹ For a discussion of this subject, see Wells A. Hutchins, *Financial Settlements of Defaulting Irrigation Enterprises*, U.S.D.A. Circular No. 72, July 1929.

²⁰ Act of May 25, 1926, 44 Stat. 649, 650.

present landowners, it is sufficient to permit an increase of \$1 per acre in land values, assuming that a capitalization rate of 5 percent is used. For most range land a dollar per acre increase represents an increase of 20 to 100 percent in value. Thus the situation is so set up that the diversion to present landowners of a very small portion of the annual benefits from irrigation can serve as a real incentive to these owners to sell their land for irrigation purposes.²¹

In the sub-humid areas, particularly in the Willamette Valley, land values are high. Before the war, the better grades of land in the Valley were valued at \$75 and \$100 and more per acre, and prices have almost doubled since then. With such high values for nonirrigated land, a considerable portion of the annual irrigation benefits would have to accrue to present landowners before there would be the opportunity, through the capitalization of these benefits into land values, to effect any appreciable percentage increase over present values. The author knows of no way to measure precisely just how much inducement the present operators will require before they are willing to sell their lands to prospective irrigators or to change to irrigation farming themselves. Undoubtedly it will vary with individuals. Some will accept irrigation farming with little or no increase in their annual income, and others will reject it even though it appears financially attractive. It is the author's considered opinion, however, that the average inducement per acre to present operators of farms in sub-humid areas will have to be substantially higher than in arid regions before the majority of them will either adopt irrigation farming themselves or sell their present holdings to farmers who are desirous of irrigating. To the extent that benefits are thus permitted to accrue to present owners of land, they are not available for repayment.

The incidence of indirect benefits, both local and national, is difficult to trace. It can be fairly well established that some local businesses have definitely benefited through irrigation developments. Since on most irrigation projects no attempt has been made to collect from local indirect beneficiaries, any benefits accruing

²¹ Persons familiar with conditions on the Columbia Basin Project in Central Washington have termed appraisals there "generous," implying that the appraisers have recognized the need to place before the landowners some incentive to change their use of the land from sheep pasture to potential irrigated lands. It is interesting to note that some of the marginal wheat lands on the eastern edge of the Project that were originally placed within the Project by their owners have been withdrawn under the stimulus of the high war-time prices of wheat.

to them have represented net gains. There are a few exceptions. Some irrigation districts have included urban property within the district and have taxed it along with the farm property to meet district obligations. On the Colorado-Big Thompson project now under construction in Colorado, a conservancy district has been formed which includes all property in the cities and towns as well as the farm land to be supplied with water. These lands will bear an ad valorem tax to assist in repaying construction costs. The same plan is to be used on the San Juan-Chama diversion project in New Mexico.

To the extent that national benefits arise through a cheaper and more adequate food supply, their incidence would rest with food consumers throughout the nation.

Summary

Irrigation development in sub-humid areas is fraught with most of the difficulties already encountered in the arid regions, plus some additional ones. The outstanding difficulties may be listed as follows:

1. So little irrigation currently is practiced in these sub-humid areas that it is difficult to obtain factual data on which to base benefit computations.

2. Most of the irrigable land in sub-humid areas is now in private ownership and in agricultural use. Many of the farms embrace large acreages. With irrigation these larger holdings may need to be broken up. Total incomes of certain individual farm operators may actually be less with irrigation than without it even though incomes per acre will be greater.

3. The problem of forecasting the portion of the irrigable acreage that actually will be irrigated each year is apt to be extremely difficult in sub-humid areas. In the 22 oldest Bureau of Reclamation projects the acreage in cultivation in 1942 was only 78 percent of the area termed irrigable by the Bureau. Most of these projects had been irrigated for 30 years, and many of them are located in arid and semi-arid portions of the West. It seems highly probable that the new developments in the sub-humid areas will not average this high a proportion of the irrigable land actually irrigated in any one year because of the possibilities for growing nonirrigated crops.

4. The costs of some of the projects proposed for the sub-humid

area are high compared with costs of previously developed areas.

5. An adequate method of calculating benefits has not been developed. The "gross value of crops" method tends to overstate benefits by not making adequate allowance for alternative uses of the production factors involved; in other words, the *opportunity costs* are not considered. The method of calculating direct benefits and local indirect benefits is good as far as it goes. A means of calculating national indirect benefits is needed.

6. Benefits from irrigation under sub-humid conditions are apt to be small. This is not because the land in these areas is necessarily less productive under irrigation than land in the arid regions, but because its production without irrigation narrows the spread between irrigated and nonirrigated output.

7. Unless a portion of the benefits accrues to present owners, there is no incentive for them to undertake irrigation or to sell their property to prospective irrigators. There is reason to believe that this incentive must be larger in sub-humid areas than was the case in arid regions. The portion of the benefits thus accruing to present landowners is not available for repayment of the costs of the project.

NOTES

NATIONAL INCOME AND FARM INCOME*

NO DOUBT most of the readers of this JOURNAL had forced upon their attention a year ago a "brochure" by Carl Wilken entitled "A Prosperous Post-War Era Is Possible" in which national income, farm income, and factory payrolls were placed in parallel and a conclusion drawn from them that high farm incomes were the antecedent causes of high national and labor incomes. Wilken's own series had a correlation coefficient of $+0.87$ between national income and farm income, and of $+0.90$ between national income and labor income. He made no mention of the latter, however. His argument was that high farm incomes raise labor incomes as well as national incomes. Income from raw materials production is the prime moving force, he argued, and all that one needs to do to insure prosperity is to raise the prices of raw materials. His presentation at the annual meeting of the National Association of Commissioners, Secretaries, and Directors of Agriculture in 1944 won many converts, and the argument is forever cropping up in unexpected places—for example, in the *Agricultural Digest* of the Doane Agricultural Service, Inc.

Figures 1 and 2 show what the correlation looks like if the years 1942, 1943 and 1944 are added. The correlation coefficients rise to $+0.978$ (agricultural) and $+0.965$ (labor). As a part of the mechanics of the correlation coefficient, of course, the extreme readings for the last three years weigh heavily in the results. The series used in this analysis are the national income and farm income series released currently by the Bureau of Agricultural Economics, and the factory payrolls series released currently by the Bureau of Labor Statistics. The coefficients based upon them for the years 1921 to 1941 are only $+0.831$ (farm incomes) and $+0.890$ (factory payrolls). Apparently Mr. Wilken and his followers will need to argue that the high prices of farm products during the war caused the full employment and high wages of labor, as well as the high national income, and from that to agriculture as the prime mover in bringing on the war.

Serious-minded farm economists are of course not led astray by

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any such shallow reasoning. There have been several among them, however, who have argued that high industrial wages are a prime necessity for high farm incomes; and who want to raise industrial wages even now so as to keep farming prosperous. They seem to believe that raising the *price* of labor is good for agriculture, just as Wilken argues that raising the *price* of raw materials is good for labor. Others have argued, of course, that what we want is an

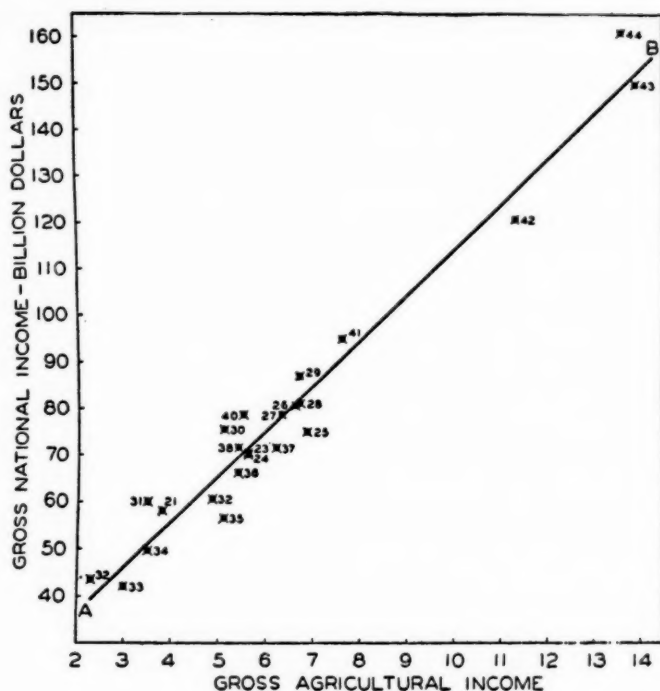


FIG. 1

abundance of raw materials at modest prices so as to increase the real income of everybody. Similarly, some argue for full employment at modest wages as a way of increasing real income, as contrasted with, for example, the stepped-up wages and unemployment of the 1934-40 years.

Pertinent in this connection is the chart published on Page 2 of the 1946 Agricultural Outlook Charts which shows how cash receipts and income of industrial workers, both expressed in the dol-

lars of the current year, travel along very closely together except in wartime. The explanation accompanying this chart runs as follows: "Changes in the purchasing power of industrial workers greatly influence the demand for, and consequently the prices of, farm products. Changes in the prices of farm products ordinarily account for most of the changes in receipts from farm marketings. Fluctuations in the income of industrial workers and cash receipts

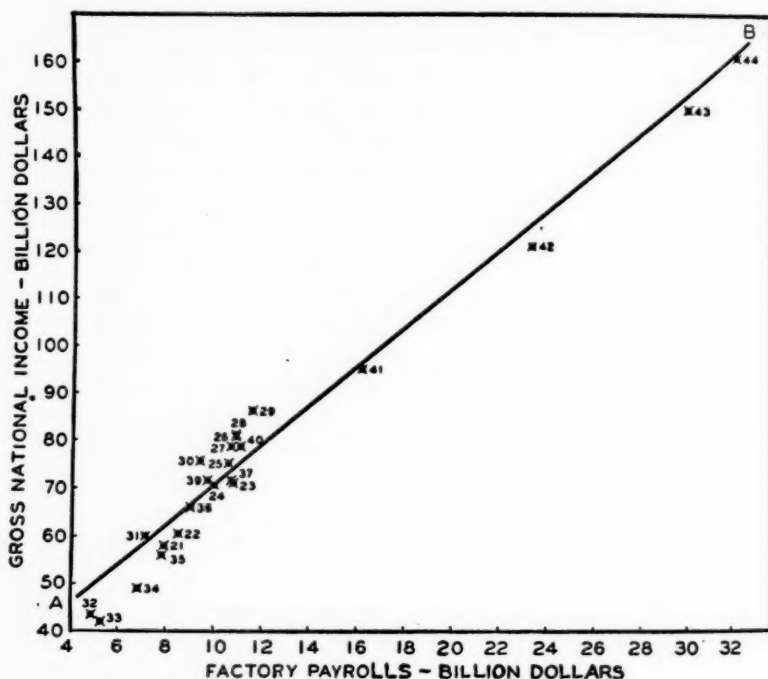


FIG. 2

from farm marketings have been similar most of the time since 1910. The series occasionally move in opposite directions, however, as in 1920, 1924, and 1945." One can understand how such writing is good propaganda in favor of a full-employment program and the like; but it is hardly in keeping with the high seriousness of the rest of the explanations in this excellent assembly of materials.

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SOME THEORETICAL ASPECTS OF AGRICULTURAL PARITY PRICE POLICIES AND NATIONAL EMPLOYMENT

PARITY price and income policies as developed under the Agricultural Adjustment Act and related legislation were conceived by their sponsors not only as a means of benefiting farm people, but also as a positive contribution toward restoring national income and maintaining it at a high level. It is not unlikely that the "national income" argument will continue to be used as a justification for supporting prices of individual agricultural products at their respective parity levels.

Full inquiry into this argument embraces the entire scope of business-cycle economics. This statement is confined to a theoretical analysis of the initial effects upon national income and employment of certain types of government programs designed to raise farm prices of individual agricultural products. Throughout the discussion it is assumed that price-increasing measures would not be undertaken unless they would result in larger total income to producers. Two kinds of measures will be considered: (1) manipulation of market supplies and (2) subsidies. In most government programs both types have been used. For purposes of exposition, however, we shall consider them separately.

The essential problem at issue is the variation in aggregate monetary demand resulting from a redistribution of income between nonagricultural and agricultural groups.¹ We shall be concerned here only with the first link in this long and complex chain. No effort will be made to trace the long-run reactions on indices of aggregate economic activity. Inquiry will be made into three questions. By what means do manipulations of agricultural supplies and subsidies to farmers affect the incomes of agricultural and non-agricultural groups? What are the expenditure characteristics of these groups? In the light of these characteristics, under what circumstances will the redistribution of income lead to an expansion of total expenditures and employment?

The form of manipulation of market supplies which we shall treat is curtailment of production. A decrease in the production of an agricultural commodity would almost always lead to an in-

¹ It is assumed that this redistribution occurs at a stage of the cycle in which supplies of productive factors are elastic in respect to price and that therefore an increase in monetary demand will be associated with an increase in physical output.

crease in its price at the farm, in intermediate markets, and to consumers. Increased income to farmers from supply restriction of a given product, unaccompanied by subsidy payments, must come from one or more of the following sources: (1) decrease in aggregate production costs; (2) decrease in aggregate marketing costs; and (3) increase in aggregate expenditures by purchasers of the commodity. Thus an increase in farm income from supply limitation must invariably be associated with an initial decrease in the incomes of other groups.

In order to demonstrate that an increase in farmers' incomes occasioned by reduction in agricultural production would expand total income of the entire economy, it must be shown that with respect to current income the marginal expenditures of farmers are higher than those of the groups whose incomes are reduced by a curtailment in agricultural production.

Numerous studies indicate that individuals in the higher-income brackets spend a smaller proportion of their income on consumption goods than do individuals in the lower-income brackets. It is reasonable to assume that if the incomes of the latter individuals were raised to a higher bracket, their expenditures would in time become quite similar to the expenditures of individuals already in the higher bracket. If this assumption is valid it follows that with respect to income, marginal expenditures on consumption goods are inversely related to level of income. Were a given amount of income shifted from the higher to the lower group, the decrement in consumption spending by the higher group would be less than the increment in consumption spending by the lower group. Hence, a shift in income from higher-income groups to lower-income groups should lead to a higher total expenditure for consumption goods by the two groups combined. Here we have assumed that expenditure by an individual on consumer goods is uniquely a function of the level of his income. We assume further that as income increases, total expenditure on consumption goods also increases, but that for any level of income an increase in disposable funds is associated with a lesser increase in expenditures for consumption. At this stage we also postulate that the distributions within income classes do not significantly affect the consumption propensities of the various classes.

Data have often been cited to indicate that the average income of farmers is lower than the average income of nonagricultural

groups. Therefore a shift of income from the latter to the former would lead to the expectation of an increase in total expenditures on commodities for consumption. However, the gains to farmers from curtailment of agricultural production accrue almost entirely to commercial farmers. Therefore, with respect to income, marginal expenditures on consumption goods are lower for those farmers who are benefited most from production control than for all farmers combined. The net effect on total expenditures of increased farm income, arising out of supply limitation, will thus depend largely on the relative proportion of benefits accruing to commercial agriculturists and their consumption propensities relative to the groups from which income was shifted.

A part of the gain to commercial farmers from restriction of production arises from a reduction in the variable costs of production. Such gains would come mainly from a decrease in labor and material costs. The average income of commercial farmers is apparently above that of hired farm workers. To the extent, therefore, that the variable costs of farming are made up of hired-labor costs, reduction in agricultural production would probably mean a decrease in total expenditures on consumption goods by commercial farmers and hired workers combined.

Where all or a portion of the variable costs of farming consist of materials purchased, curtailment in agricultural production leads to a shift in income from material suppliers to commercial farmers. The effect of such a shift in total expenditures on consumption goods should be determined by two factors: (1) the extent to which material suppliers reduce income payments to individuals, as a result of the decrease in their own receipts; and (2) the level of income of such persons relative to the level of income of commercial farmers.

In the short run, at least, it seems improbable that a given reduction in the income of material suppliers, as a result of diminished sales, would lead to the same absolute reduction in their payments to employees and stockholders. However, some reduction in income payments by material suppliers to individuals would probably occur. Since loss of volume occasions the reduction in income payments, such reduction would probably be concentrated on persons employed on piecework or by the day rather than on permanent employees, officials, or stockholders. It seems reasonable to assume that the average level of income of the former group is

lower than that of the latter. Thus, reduction in income payments by material suppliers would probably be directed at those persons whose expenditures on consumption goods would be most affected by a change in their incomes.

Sufficient data are not available to determine how the average income of commercial farmers compares with the average income of workers employed by industries and trades which supply materials used in agricultural production. If the average income of commercial farmers is no larger than that of such workers, curtailment in agricultural production, and consequent reduction in the purchase of production materials by farmers, would result in larger total expenditures on consumption goods. On the other hand, smaller total expenditures could occur if the average income of commercial farmers is substantially above that of the group to whom payments were decreased, even though a part of the increase in income to farmers comes out of various reserve balances of the material supplier.

A decrease in the quantity marketed generally means a decrease in total marketing charges, since marketing margins tend to be more stable than selling prices. These charges comprise, of course, the income of the marketing agencies. Curtailment in market supplies results, therefore, in a shift in income from marketing agencies to commercial farmers. The effects of such a shift upon expenditures for consumption goods depend upon the two factors mentioned in the case of material suppliers. Also, the various issues involved are essentially the same as in that case, and hence need not be repeated.

Curtailment of supply means higher prices to consumers. Whether these higher prices result in larger or smaller expenditures by consumers for other consumption goods depends largely upon the elasticity of demand at retail of the commodity where production is curtailed.

The demand of persons in the higher-income brackets for a given food or for all foods combined is probably inelastic, at least throughout a wide range of prices. As the price of food rises, the increase in total expenditures for food by persons in these brackets will tend to come out of savings rather than from a decrease in expenditures for other consumption goods. Hence, as far as the rich and well-to-do are concerned, higher prices for food would tend to expand their total expenditures for all consumption goods combined. And if the increased expenditures for food by the rich were

reflected in an increase in the income of farmers, farmers' expenditures on consumption goods would also rise.

In the absence of price discrimination, however, an increase in the price of food to persons in the higher-income brackets would also mean an increase in the price of food to persons in the medium- and lower-income brackets. Although the demands of persons in the medium- and lower-income brackets differ widely, they are probably inelastic for some foods, for others, elastic, and for still others, of unit elasticity.

On those items of food for which the demand of persons in the medium-income bracket is inelastic, increased expenditures occasioned by higher prices would probably come in part out of savings and in part out of expenditures on other consumption goods. To the extent that their increased expenditures on a food come out of savings, the net effect would be an increase in their total expenditures on consumption goods. But where their increased expenditures on a given food are accompanied by a corresponding reduction in their expenditures for other consumption goods, the net effect would be to leave their total expenditures on consumption goods unchanged.

The great mass of low-income families spend practically all of their income on consumption goods. Therefore, on those foods for which their demand is inelastic, increased expenditures, occasioned by higher prices, would necessarily mean a corresponding reduction in their expenditures on other consumption goods.

Reduction in the supply of a given consumption good, the demand for which is elastic, means that consumers have more money to spend on other consumption goods. The extent to which expenditures on other consumption goods are increased, however, will depend upon incomes. Low-income families will probably increase their expenditures on other consumption goods by the amount that their expenditures on the particular commodity are reduced. Medium-income families will also likely increase their expenditures on other consumption goods by approximately the amount that their expenditures on the particular commodity are reduced. They are not likely to add much to their modest savings since their real income is diminished. High-income families, on the other hand, will probably increase their expenditures on other consumption goods little, if any, because of a reduction in their expenditures on a particular commodity. Instead, they are likely

to add to their savings. As already mentioned, however, the demand of persons in the higher-income brackets for a given food or for all foods combined is probably inelastic. Hence, curtailment of supplies and higher prices of a food would probably not result in any decrease in the expenditures of the rich for such food.

The foregoing analysis suggests two general propositions with respect to the effects of curtailment in supplies and higher prices of a given food or group of foods upon total consumers' expenditures on other consumption goods: (1) If the demand for the given food on the part of each of the income groups is inelastic, consumers' total expenditures on other consumption goods would be reduced, but not by as large an amount as the increase in their combined expenditures on the given food item. (2) If the demand for the given food on the part of the lower- and medium-income groups is elastic and if that of the higher-income group is inelastic, consumers' total expenditures on other consumption goods would be increased by a larger amount than the reduction in their combined expenditures on the given food.

The first proposition implies a shift in income from the suppliers of other consumption goods to those farmers who produce the given food. The increase in income to farmers is larger in absolute amount than the decrease in income of the suppliers of other consumption goods. A reduction in the income of suppliers of other consumption goods of a lesser amount than the increase in income of farmers would result in a decrease in total expenditures on consumption goods, if all of the decrease in the suppliers' incomes were passed on in the form of reduced income payments to individuals whose level of income is substantially below that of commercial farmers. The second proposition implies an increase in the income of the suppliers of other consumption goods and, at the same time, an increase in the income of those farmers who produce the given food. On the other hand, there would be decreases in the incomes of marketing agencies, farm material suppliers, and hired farm workers. These decreases would all be greater in the case of a food, whose demand at retail is elastic, than in the case of one whose demand at retail is inelastic, assuming, in both cases, the same rise in farm prices, the same amount and rigidity of marketing margins, and the same proportion of variable costs of production.

In lieu of manipulation of market supplies, prices received by farmers could be maintained at parity levels by direct government

payments equal to the difference between the computed parity price and the prevailing market price. We need to inquire, therefore, into the effects of such parity price payments on national income and employment.

First, we shall consider the case in which the parity price payments are financed out of current tax receipts. The use of general sales taxes for financing parity price payments would mean a shift in spending power from consumers in general to farmers. While expenditures on consumption goods by persons in the higher-income brackets would not be reduced, expenditures by persons in the medium-income brackets and particularly by persons in the lower-income brackets would be curtailed. Whether increased expenditures on consumption goods by farmers would be sufficient or more than sufficient to offset the decreased expenditures of other groups would depend in part upon the level of income of farmers and of the other groups. Since the benefits of parity price payments would accrue mainly to commercial farmers, whose incomes are above the average of all farmers, and since the burden of a general sales tax would fall more heavily on the lower-income groups in the nation, there is some reason for supposing that parity price payments financed out of general sales taxes would have an adverse effect on total expenditures on consumption goods.

On the other hand, if parity price payments were financed out of personal income-tax collections, the effect would probably be to increase total expenditures on consumption goods, particularly if the additional income taxes needed to meet the parity payments were based on a steeply graduated schedule similar to the one now in effect.

Parity price payments may, of course, be financed for a time, at least, out of borrowings rather than out of tax receipts. In fact, most of the agricultural price-supporting programs have been so financed. It seems clear that the initial effect of parity price payments on total national expenditures on consumption goods is greater when such payments come from borrowings than from taxes.

Thus far we have dealt with the effects of shifts in income upon expenditures for consumption goods. We need now to consider the effects of such shifts on expenditures for investment goods.

There is some evidence to indicate that farmers increase their expenditures on production goods as their income rises. To a larger extent than in most other classes, farmers directly control the dis-

position of that part of their income not spent on consumption. However, that part of the increased income to farmers which is not directed to consumption goods is ordinarily used by them not only to buy additional farm production goods, but also to retire debts, and to acquire more land. And it may be used to increase cash balances or to purchase securities. But savings directed toward retirement of debts, acquisition of additional land or securities, or expansion of cash balances, however meritorious from the standpoint of the individual farmer, may have little effect upon national expenditures. It is only if the increments to income not spent on consumption goods are used by the farmer to purchase additional farm equipment, such as machinery and farm buildings, that total national expenditures are certain to be stimulated.

Parity price policies themselves tend to limit the range of investment expenditure for productive equipment. Where gains come from supply limitation, expenditure on new equipment which will expand output is inconsistent with the objectives of the program. Thus the only types of equipment which may be purchased, and yet conform to the aims of the policy, are those which decrease the cost of producing a given quantity of the commodity, or which contribute to the leisure or comfort of the farm family. Insofar as such expenditures are made, total spending on investment goods should be expected to increase. However, if farm laborers are displaced by the investment of farmers in new equipment, the increase in expenditures for equipment is offset by decreased expenditure of hired farm labor for consumption goods.

When the gains to farmers come from subsidies, this explicit limitation on their expenditures for production goods does not occur. Nevertheless, if the subsidies are paid from current tax receipts, the effect on total national expenditures of larger purchases by farmers of new equipment used to expand output will subsequently be offset in part by reduced expenditures by tax-payers. Expansion of agricultural production will tend to drive prices down, and this widening of the spread between computed parity prices and prevailing market prices, together with the increase in the number of units on which the parity price payments must be made, will call for larger subsidies and hence for larger tax collections.

The foregoing discussion is intended to help isolate and define some of the important questions concerning the effects of agricultural parity price policies on national income and employment. It

does not purport to provide answers to those questions. Answers can be found only through careful and comprehensive empirical investigations.

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AGRICULTURAL PRICES AND NATIONAL INCOME

MANY models have been constructed for our postwar America showing how consumer expenditure, private investment, and public spending can be adjusted to give full employment at high levels of national income. Within the aggregate "national income," however, the agricultural economy has remained in a disadvantaged position through several decades. Some means must be worked out for agriculture to share in the hoped-for general prosperity.

Roughly one-fifth of America's people live on farms, but as of the period 1935-39 they commanded only one-tenth of the nation's income. What determines and controls the farmer's share of the national income dollar?

In seeking an answer to this question, an extension of the Keynesian technique of aggregative analysis offers a fruitful field for exploration. In this technique, the national economy is first described by the simple equation, $Y = C + I$. Y stands for national income, C stands for consumption, and I stands for investment. There is another form of the equation which substitutes S , savings, for I . These equations mean (1) that, out of income received, what is not spent on consumption is saved; and (2) this national income is composed of money spent on consumption plus money spent in investment—for investment means the present spending of money in expectation of some future return.

This system also makes use of two psychological factors—the propensity to consume, k , and the propensity to invest. The propensity to consume is the tendency to spend a given amount of income on consumption, and rises to its highest value of one among low-income people who spend 100% of their income day-to-day on consumption. Investment is generally based on the prospect of future returns which can be gathered from the history of previous consumption. Therefore, investment in the current year, t , can be

expressed as the propensity to invest, b , times the difference (increase or decrease) between last year's consumption, C_{t-1} and the year before, $t-2$, expressed thus: $I_t = b(C_{t-1} - C_{t-2})$. Substituting this formula for I in the national income equation, you can get an expression of national income solely in terms of consumer spending, $Y_t = C_t + b(C_{t-1} - C_{t-2})$, which is particularly useful in getting a quick working picture of the relations between national income and consumption. This method has direct application to agricultural problems when we remember that the money spent in consumer buying creates the market for farm products.

The role of investment in creating national income and consumer spending on farm products is best expressed by a concept known as the "investment multiplier." The multiplier shows, according to Samuelson, "the ratio of the total increase in national income to the total amount of investment, governmental and private." The multiplier is expressed as $1/1-k$, where k is the propensity to consume. "Multiplier" is probably a bad word because it seems to imply some sort of accelerated effect. What the multiplier does tell us, in analysis, is the increase in national income which you can expect from a given increase in investment.

This scheme of analysis, which has been borrowed from the theoretical economists, can be applied to analyze the effect of increased prices for farm products on both national income and farm income. For the purposes of the following model, it has been assumed that an effort will be made to increase farm income through the parity price techniques embodied in the Steagall Amendment. The data in the model have been derived from 1935-39 income and expenditure relations, the 1935-36 and 1941-42 consumer surveys, and Department of Commerce expenditure estimates. It is assumed that (1) the short-run demand curve for food in the aggregate is fairly inelastic, so that roughly the same quantity of food would be consumed in years I and II; (2) that, short of better information, the proportions of income spent by farm and nonfarm families for their living will not change from year I to year II except as affected by food price increases; (3) that overall consumption expenditure will be the same for the nonfarm population in years I and II; and (4) that \$100,000,000,000 is a model estimate of "normal" postwar national income and not a forecast.

	Year I	Year II*
	(millions)	(millions)
National income	\$100,000	\$100,559
Farm income**	11,280	11,839
Farm living expenses	7,930	7,949
Food expenditure	2,010	2,162
Housing	199	214
Household operation	1,078	1,160
Clothing	879	945
Automobile	923	993
Other transportation	29	31
Other	1,514	1,629
Savings	763	810
Nonfarm income	88,720	88,720
Food expenditure	23,789	25,276
Housing	11,200	10,893
Household operation	12,620	12,274
Clothing	10,420	10,135
Automobile	6,270	6,098
Other transportation	1,970	1,916
Other	11,785	11,462
Total expenditure	78,754	78,754
Personal taxes	2,750	2,750
Income remainder (savings)	7,215	7,215

* Year II is assumed to be identical with year I, except that the Steagall Amendment is supposed to be in effect, with prices at 90 percent of parity and farm prices 10 percent higher.

** This farm income figure includes farmer income from off-farm work and investments, and is therefore not comparable to the conventional "net income to persons on farms from farming."

With \$100,000,000,000 national income in year I, farm prices at 90 percent of parity would increase agricultural income something over \$500,000,000 in year II, if the same quantity of food that was sold in year I were bought at the higher prices of year II. Consumers *might* shift their consumption to buy a lower dollar volume of food than the maximum position of year I quantities at year II prices. Increased purchases of goods by farmers in year II, indicated by their propensity to consume, would be offset by reduced consumption or reduced savings in the nonfarm economy. In the Keynesian equation it can be seen that neither in the case of reduced C_n or reduced S , could the nonfarm economy contribute any net increment to Y .

To summarize the model, the thesis is this: Prices at 90 percent of parity would be 10 percent above the "normal" indicated by the 1935-39 average. With the demand for food inelastic in the

short run, this price increase plus correspondingly increased marketing margins would be absorbed by the consumer. The increase in farm income, because of marketing margins, would be less than the increase in consumer food expenditure. The stimulus to consumption and investment offered by increased farm income and spending would be less than the reduction in either nonfarm savings, or nonfarm purchases other than food.

If nonfarm expenditure remains constant but farm expenditure rises, we might expect an increase in investment. If the propensity to invest is less than unity, the maximum possible induced investment would be less than another \$500,000,000. Thus, in year II, we can see that higher farm prices, creating increased farmer spending, and inducing increased investment, could contribute a possible maximum of \$1,000,000,000 or one percent increase to the national income.

Further, increases in farm expenditure may be reduced by the fact that farmers themselves spend an average of almost one-third of their net cash income for food. And farm food demand should be more elastic than nonfarm demand, in view of the potentialities of the kitchen garden. Then again, the reduction in consumer spending on nonfarm products may exert a depressive effect on business activity in the nonfarm sections of the economy, which could mean a reduction in national income from year II to year III.

.....

The problem of agricultural price policy in the next few years seems to lend itself thoroughly to "multiplier analysis." The above discussion should point to what extent the problem of farm prices and farm income is involved in the whole problem of national income, expenditure, and investment. General equilibrium analysis should show both to what extent a prosperous agriculture can contribute to national prosperity, and, more important quantitatively, the extent to which high levels of nonfarm employment, sustained by high levels of consumption and a continuous program of planned private and public investment, can insure the farmer a market for his produce at reasonable prices.

One last point should be made here: It will be argued that the abandonment of the parity formula, and of general efforts to raise farm income through raising food prices *without* counterbalancing adjustments in the rest of the economy, may be justified in terms

of maintaining a high level of consumer food purchases. But how about the farmer's relative position? How about his income parity? The above sketchy analysis should show at least in large that the achievement of such parity through higher prices for farm products will defeat itself in lowered overall nonfarm consumption. Perhaps the purpose of introducing a technique of general equilibrium analysis in agricultural problems and pointing up the impossibility of agricultural adjustments made without regard to the rest of the economy, is to suggest that the solution to farm income parity lies away from price policy, in the field of population and resources allocation, farm reorganization, and changed agricultural production. It is to be hoped that more careful and extensive research along the lines of farm-nonfarm economic *interdependence* will soon be initiated to establish or explode this idea.

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A QUANTITATIVE COMPARISON OF AGRICULTURAL PRICE PLANS

THIS paper presents the results of a preliminary quantitative appraisal of certain widely advocated agricultural price plans. Heretofore most of the discussion of these plans has been in general terms. It is well, however, also to have in mind the approximate magnitude of the economic variables under discussion. It is the purpose of this paper to provide quantitative measurements of some of them. The analysis makes no pretense to completeness either in scope or in detail. The procedure is to assume demand curves for both the domestic and export markets for the various commodities. The results of the application of the various plans to specified volumes of output are then examined, and certain comparisons among the plans follow.

The results obviously depend in large part upon the demand curves assumed. Their precise nature is unknown, but past studies have been employed to provide assumptions that appear reasonable. These basic assumptions have been tabulated in Table 1. The curves represent a level of demand with nearly full employment in the United States and a strong export demand. These curves would generally result in prices approximating those in the recent publi-

cation of the United States Department of Agriculture *What Peace Can Mean to American Farmers* under free markets with the quantities of output indicated in that publication.

TABLE 1
ASSUMED DOMESTIC AND EXPORT DEMAND FOR VARIOUS
AGRICULTURAL COMMODITIES

Commodity	Domestic market			Export market		
	Price	Quantity sold at this price	Elasticity of demand	Price	Quantity sold at this price	Elasticity of demand
Wheat	\$ 1.00 bu.	600 mil. bus.	0.5	\$.80 bu.	200 mil. bus.	4.0
Cotton	.20 lb.	6 mil. bales	0.8	.16 lb.	3 mil. bales	2.0
Hogs	11.00 cwt.	16 bil. lbs.	0.5	10.00 cwt.	800 mil. lbs.	4.0
Milk	2.40 cwt.	100 bil. lbs.	0.8	2.40 cwt.	500 mil. lbs.	5.0

The prices and disposition of the outputs that would result under free markets are indicated in Table 2 for the assumed levels of output.

TABLE 2
DISPOSITION AND VALUE OF UNITED STATES PRODUCTION IN A FREE MARKET FOR
ASSUMED OUTPUT OF VARIOUS COMMODITIES

Commodity	Domestic market				Export market		Total
	Output	Price (dollars per unit)	Quantity (millions)	Value (million dollars)	Quantity (millions)	Value (million dollars)	Value (million dollars)
Wheat	1 bil. bus.	.725	704	511	296	214	725
Cotton	12 mil. bales	.139	8.02	557	3.98	278	835
Pork	16 bil. lbs.	.1163	15,560	1810	440	51	1,851
Milk	100 bil. lbs.	2.414	99,530	2403	470	11	2,414

These prices, quantities, and values furnish the benchmarks against which the various plans are compared. If some other output is assumed, the results would be different. In general, the difference between the various schemes and the free market becomes greater the larger the output. Since our assumed outputs are large, the probability is strong that in many cases the differences would be less than we have indicated. The level of business activity and employment also influences the results since the level of demand and perhaps the elasticity changes with these factors. In general, the various plans show a greater divergence from the free market the lower the levels of income and, consequently, demand. While this is important to the total income derived from the sale of the product, it is relatively unimportant in producing differences among the

plans at a given level. We, therefore, proceed without examination of this factor except in the case of support prices.

The plans examined are the two-price plan together with its variants in the form of support prices, the export subsidy, the domestic subsidy and a general overall subsidy. All considerations of administrative costs are disregarded as are likewise leakages of farmers' incomes thru changes in margins, evasions, and so on. The influence of price upon subsequent production is likewise disregarded even though it becomes a pertinent factor without production controls. The analysis also assumes that the export market will absorb such quantities as we may wish to place upon it. As a practical matter, this is questionable, and schemes designed to increase export sales may meet barriers in foreign countries designed to offset them.

Two-Price Plan

The two-price plan supposes a relatively high price to be established in the domestic market with domestic consumers taking what they will at this price, and the remainder of the output sold in the export market for whatever it will bring. The plan has its greatest revenue producing possibilities over the free market when the demand in the domestic market is inelastic and the demand in the export market is elastic. Under these circumstances, there will be an increase in the expenditures of domestic consumers for their smaller quantity and an increased value of the larger sales in the export market. The domestic prices which would need to be established to increase producer revenues by specified amounts under the conditions assumed for Table 2 are given in Table 3.

TABLE 3
DOMESTIC PRICES REQUIRED TO RAISE PRODUCER RETURNS BY SPECIFIED
AMOUNTS ABOVE FREE MARKET LEVELS WITH A TWO-PRICE PLAN

Increase in producer returns over free market (million dollars)	Wheat billion bushel crop (dollars per bushel)	Cotton 12 million bale crop (cents per pound)	Hogs 16 billion pounds (dollars per hundred- weight)	Milk 100 billion pounds (dollars per hundred- weight)
100	\$.905	20.0	\$12.42	\$2.575
200	1.11	25.0	13.30	2.757
300	1.40		14.26	3.020

These prices may be compared with those resulting from the sale of the same volume of the commodity in the free market as shown in Table 2. The increases over the free market level required to produce a revenue to producers of 100 million dollars above the free market amount to about 18 cents a bushel on wheat, 80 cents a hundredweight on hogs, 6 cents a pound on cotton and 16 cents a hundredweight on milk. Doubling the income increase requires more than doubling the difference from the free market price. For example, while an 18 cent increase in wheat prices over what would

TABLE 4

PRICES AND DISPOSITION OF QUANTITIES UNDER TWO-PRICE PLAN DESIGNED TO INCREASE FARM RETURNS BY 100 MILLION DOLLARS FOR VARIOUS COMMODITIES

Commodity	Domestic market			Export market			Total return
	Price (cents)	Quantity (million)	Value (million dollars)	Price (cents)	Quantity (millions)	Value (million dollars)	
Wheat	90.5 per bu.	634 bu.	573	68.8 per bu.	366 bu.	252.	825
Cotton	20.0 per lb.	6.00 bales	600	11.3 per lb.	6.0 bales	339.	939
Hogs	12.4¢ per lb.	15,050 cwt.	1870	9.58 per lb.	950 cwt.	91.	1961
Milk	2.575 per lb.	94,500 cwt.	2433	1.486 per cwt.	5500 cwt.	82.	2515

have been the free market level might have increased the level of income by 100 million dollars, an increase of 38.5 cents would have been required for 200 million dollars.

The difference between the domestic and the export price under the two-price plan is of considerable significance. Domestic consumers are certain to compare their price with that of the export market and to object to a large difference. The spread is also important as an encouragement to imports, and the price raising possible under the plan will be limited by existing tariffs. These differences in price become quite large under our assumed demand (see Table 4). For a 100 million dollar increase in revenue, the differences are about \$2.84 a hundredweight for hogs and \$1.09 a hundredweight for milk. There is evidently an early limitation to the expansion of revenue from a two-price plan from this source. If tariffs are raised in support of such a plan, this has far-reaching implications. This would cancel out our reciprocal trade program and other efforts to break down trade barriers, since it is improbable that we can raise tariffs on farm products without opening up the entire range of all products to similar protection.

The results upon the domestic economy of plans to enhance

producer revenues by 100 million dollars from the various commodities are shown in Table 5. An increase of about 25 percent in domestic wheat prices has increased producer revenues by about 14 percent. A 45 percent increase in domestic cotton prices would increase producer revenues around 12 percent. For hogs the price increase is 7 percent and income 5.3 percent and for milk 6.7 percent and 4.1 percent. The increase in revenue is thus much less relatively than the increase in domestic prices.

TABLE 5
SOURCES OF AN INCREASE IN PRODUCER REVENUE APPROXIMATING 100
MILLION DOLLARS OVER FREE MARKETS BY A TWO-PRICE PLAN

Commodity	Price established (dollars)	Increased revenue to producers (million dollars)	Increased domestic expenditures (million dollars)	Increased export sales (million dollars)	Shift in quantities from domestic to export market (millions)
Wheat	.905 per bu.	98	59	39	75.0 bus.
Cotton	.200 per lb.	104	43	61	2.02 bales
Pork	12.42 per cwt.	99	59	40	510.0 cwt.
Milk	2.575 per cwt.	102	31	71	5030.0 lbs.

The combination of changes in quantities and changes in prices prevents an accurate appraisal of the net costs of the two-price plans. The solution will depend upon the value placed upon the quantities shifted from the domestic to the export market, and this value assignment is entirely arbitrary. Certain limiting observations are, however, possible for the domestic economy as a whole. In wheat, for example, 75 million bushels have been shifted from the domestic to the world market, and dollar income from export sales has been increased by 39 million dollars. This is an average of 52 cents per bushel. If wheat sells for more than 52 cents in the domestic market, there has been a loss to the domestic economy as a whole from the operations. In this case, it is obvious that a loss is incurred since the domestic price of wheat is 90.5 cents under the plan. Computations for the other commodities all show the plan to result in net losses to the economy.

The amounts which producers receive from the larger expenditures by domestic consumers represent transfers within the domestic economy. Whether these are desirable or undesirable it is impossible to say without assumptions regarding the relative utility

of a dollar to producers and consumers, and whether a dollar in the hands of farmers has a greater stimulating effect upon the economy than a dollar in the hands of consumers. There seems to be no basis for the latter assumption.

The domestic consumer clearly suffers from the plans. He pays a larger sum for less of the commodity. He loses not only the satisfaction which he might have secured elsewhere from the additional dollars he is forced to spend on the commodity, but also the satisfaction which he might have obtained from the quantities of the commodity which he is unwilling to consume at these prices.

Support Prices

The support price program is a variant of the two-price plan. Prices are supported in the domestic market above a level which

TABLE 6
DISPOSITION OF QUANTITIES AND RETURNS UNDER SUPPORT PRICES AT
90 PERCENT OF ASSUMED PARITY PRICES

Commodity	Price (dollars per unit)	Quantity (millions)	Value (million dollars)	Price (cents)	Quantity (millions)	Value (million dol- lars)	Sub- sidy (million dol- lars)	Total return (million dollars)
Wheat	1.31 per bu.	526 bus.	689	64.48 per bus.	474 bus.	305	316	1310
Cotton	.178 per lb.	6.586 bales	586	11.91 per lb.	5.414 bales	322	160	1068
Hogs	above support							
Milk	above support							

would be established under the operation of a free market, and the quantities unabsorbed by the domestic market must find outlets elsewhere. We may assume that the available market is the export market and analyze the problem using our assumed curves. In this analysis, the general level of demand is a factor of such importance that we will need to consider it in our analysis. At nearly full employment, we assume that the index of the cost of things bought by farmers is 165 and that the supports will remain at 90 percent of parity. At the levels of demand which we have assumed, the market prices for hogs and milk would be above the support levels and would in consequence not be affected.

Table 6 shows the division of the quantities between the export and domestic market for the assumed support prices. Since the government is required to buy all the product offered at the sup-

port price, the difference between the total value of the output at support prices and the sum of sales in the two markets represents the unrecoverable expenditures by the government. These have been indicated as a subsidy.

The data have been arranged in Table 7 to show the source of returns to farmers. The increase in domestic expenditures and the subsidy payments may be considered the domestic dollar costs of the program.

TABLE 7
AMOUNT AND SOURCE OF RETURNS TO PRODUCERS OVER THE FREE
MARKET AS A RESULT OF SUPPORT PRICES

Com- modity	Total increase in farmers' income	Increased export sales	Total domestic cost	Increased domestic expendi- tures	Subsidy or loss to government on its purchases
			(million dollars)		
Wheat	585	9	494	178	316
Cotton	233	44	189	29	160
Hogs	0	0	0	0	0
Milk	0	0	0	0	0

It is evident that the costs of the support price program are large and are borne principally by the domestic economy.

The extent of government subsidy required under the support price program will depend largely upon the strength of the domestic and foreign demand. The extent of the subsidies required under demands assumed to be 20 per cent smaller than the basic assumptions employed in the other comparison have accordingly been computed and shown in Table 8.

Since only a portion of all farm commodities are included in the

TABLE 8
GOVERNMENT SUBSIDIES REQUIRED FOR THE PRICE SUPPORT PROGRAM UNDER
FULL EMPLOYMENT AND UNDER A 20 PERCENT SMALLER DEMAND

Commodity	Under approximately fully employment	Under a 20 per cent reduced demand
	(million dollars)	(million dollars)
Wheat	316	432
Cotton	189	315
Hogs	0	63
Milk	0	68

group which we analyze, we are unable to state the total transfers required under the support price program in the United States. With full employment, the amount does not appear to be large, but with a 20 percent decline in demand it would amount to a billion and a half to two billion dollars annually.

Export Subsidy

An export subsidy permits exporters to offer the product at lower prices and increases exports. The smaller quantities available for domestic consumption increase domestic prices. The extent to which domestic prices are increased and the extent to which export prices fall depends both upon the relative size of the export market and the relative elasticities of demand in the two markets. The subsidy with a commodity such as pork which is normally exported

TABLE 9

EXPORT SUBSIDY RATES REQUIRED TO INCREASE PRODUCER RETURNS ABOVE THE FREE MARKET BY SPECIFIED AMOUNTS FOR VARIOUS COMMODITIES

Increase in producer returns (million dollars)	Wheat billion bushel crop (cents per bushel)	Cotton 12 million bale crop (cents per pound)	Hogs 16 billion pound output (dollars per hundred- weight)	Milk 100 billion pound output (dollars per hundred- weight)
100	12.5	2.8	2.59	.901
200	24.2	5.8	3.88	1.182
300	34.0	12.5	4.85	1.379

in small quantities results largely in an increase in the domestic price. With cotton, on the other hand, the decline in the export price is about equal to the rise in the domestic price.

The export subsidies required on the various commodities to produce specified increases in farmers' returns above the free market level are shown in Table 9.

The division of the quantities between the export and the domestic market under export subsidies designed to increase producer revenues by 100 million dollars are shown in Table 10. The difference between the domestic and export prices is the amount of the subsidy. It will be observed that the possibilities of increasing producer returns without creating a spread that exceeds existing tariff rates are much greater under an export subsidy than under the two-price plan.

TABLE 10

PRICES AND DISPOSITION OF QUANTITIES UNDER EXPORT SUBSIDIES DESIGNED TO INCREASE FARM RETURNS BY 100 MILLION DOLLARS FOR VARIOUS COMMODITIES

Commodity	Domestic market			Export market			Subsidy (million dollars)	Total return (million dollars)
	Price (cents)	Quantity (millions)	Value (million dollars)	Price (cents)	Quantity (millions)	Value (million dollars)		
Wheat	82.5 per bu.	660 bus.	545	70.0 per bu.	340 bus.	238	42	825
Cotton	15.6 per lb.	7.29 bales	570	12.8 per lb.	4.71 bales	301	67	938
Hogs	12.25 per lb.	15,162 lbs.	1837	9.66 per lb.	838 lbs.	81	81	1960
Milk	2.514 per lb.	96,350 lbs.	2422	1.613 per lb.	3650 lbs.	59	59	2514

The changes in the disposition of quantities and expenditures by the domestic and export market from the free market situation are shown for the subsidy rates required for a hundred million dollar increase in income in Table 11.

The quantities transferred from the domestic to the export market under an export subsidy are smaller than those under a two-price plan resulting in the same increase in producer revenues. Domestic dollar sales increase less and likewise does the value of export sales. The difference is made up by the subsidy. Since domestic consumers have a larger quantity to consume at a lower price under the export subsidy, it has an advantage for them over the two-price plan.

Whether the export subsidy has been profitable to the general economy may be tested in the same manner as the two-price plan. With wheat 45 million additional bushels have been sold in the export market at an increased return of 24 million dollars. This

TABLE 11

CHANGES IN QUANTITIES AND EXPENDITURES FROM THE FREE MARKET UNDER EXPORT SUBSIDIES DESIGNED TO INCREASE PRODUCER REVENUES BY ABOUT 100 MILLION DOLLARS

Commodity	Increased producer revenue (million dollars)	Increased domestic expenditures (million dollars)	Increased export sales (million dollars)	Subsidy payments (million dollars)	Shift in quantity from domestic to export market (millions)
Wheat	100	34	24	42	45
Cotton	103	13	23	67	0.71
Hogs	99	47	30	22	398
Milk	100	19	48	33	3180

amounts to 53.3 cents per bushel, and since wheat is at a higher price in the domestic market, the plan has resulted in a net cost to the economy. The difference between the export returns and the domestic price is somewhat less under the export subsidy than under a two-price plan. We may, therefore, conclude that while the export subsidy plans involve a net cost to the domestic economy, this cost is somewhat lower than that of the two-price plan. The other commodities show similar results.

Domestic Subsidy

The results of a domestic subsidy paid to processors or dealers will be to lower prices to domestic consumers and in consequence

TABLE 12

DOMESTIC SUBSIDY RATES REQUIRED TO INCREASE RETURNS TO PRODUCERS BY 100 MILLION DOLLARS ABOVE THE FREE MARKET LEVEL

Increase in producer returns (million dollars)	Wheat billion bushel crop (cents per bushel)	Cotton 12 million bale crop (cents per pound)	Hogs 16 million pound output (dollars per hundred- weight)	Milk 100 million pound output (dollars per hundred- weight)
100	29.2	3.3	.75	0.102
200	46.6	5.9	1.48	0.214
300	60.4	8.6	2.17	0.305

to increase the quantities sold in the domestic market. This curtails exports and increases the export price. Prices to producers will be at the equivalent of the export price level. Producer prices will thus be higher but by less than the amount of the subsidy. With our assumed curves, the decline in the domestic consumer price is larger than the increase in export prices. The total value of the combined sales in the domestic and export markets is less than under a free market, but the subsidy payments increase the income to producers above that of the free market. The domestic subsidy rates required to increase farm returns from the various commodities by specified amounts are indicated in Table 12.

The disposition of quantities and values under domestic subsidies sufficient to raise producer revenues by 100 million dollars with the various commodities are shown in Table 13.

The domestic subsidies result in domestic consumers having

more of the product at a lower price. They are thus advantageous to this group.

If the subsidy were paid directly to the farmers, market prices would remain at the free market level and there would be no change in the disposition of commodities. Farmers' incomes would be enhanced by the amount of the subsidy payments. The result would be simply a transfer of income from the remainder of the community to farmers.

If the subsidy were paid to consumers in some form available only for the purchase of the commodity, the domestic demand curve for the commodity would be raised. Domestic consumption would increase under these circumstances and prices would rise.

TABLE 13
PRICES AND DISPOSITION OF QUANTITIES UNDER DOMESTIC SUBSIDIES
DESIGNED TO INCREASE FARM RETURNS BY 100 MILLION
DOLLARS FOR VARIOUS COMMODITIES

Commodity	Domestic market			Export market			Total return (million dollars)
	Price (cents)	Quantity (millions)	Value (million dollars)	Price (cents)	Quantity (millions)	Value (million dollars)	
Wheat	53.8 per bu.	823 bus.	439	82.5 per bu.	177 bus.	144	823
Cotton	12.82 per lb.	8,844 bales	545	15.6 per lb.	3,156 bales	246	936
Hogs	11.50 per lb.	15,645 lbs.	1799	12.25 per lb.	355 lbs.	44	1960
Milk	2.412 per lb.	99,604 lbs.	2402	2.514 per lb.	396 lbs.	10	2514

Exports would be curtailed and export prices would also rise. The results are thus analogous to those of a dealer subsidy. Since, however, they involve a shift in the demand curve, we do not analyze them here.

General Subsidy

If a subsidy is paid on all units of a commodity regardless of where sold, there would be no change from the free market utilization. Prices would rise to producers by the amount of the subsidy and their income would be increased by the amount of the subsidy payments.

Comparison of Plans

It is beyond the scope of this study to decide whether it is good public policy to transfer income from other members of the community to farmers. It is assumed that such a decision has been

reached and various methods are to be considered. The income transferred may be drawn solely from the consumers of the particular commodity or the transfer may be in part at least passed on to the community as a whole through the payment of subsidies. There seems to be no reason for believing that a transfer of income from the consumer of a product to farmers is more desirable than a transfer from nonconsumers. The choice would appear to rest on other grounds, such as amount or use of income. If subsidies are used, their ultimate source is taxes, of which farmers pay a part. The income to farmers which we have indicated is thus a gross income rather than a net income after payment of their contribution in the form of taxes. Increased taxation of consumers to pay subsidies would no doubt have some influence upon their demands, but this has been ignored in the analysis.

The two-price plan secures the entire increase in farm returns from the consumers of the product. It bears heavily upon domestic consumers because it results for them in a larger expenditure for a smaller quantity. For the domestic economy as a whole, the plan clearly involves a net loss, subject to gains, if any, that may have been secured from an internal transfer of funds among the members of the community. The export subsidy curtails domestic consumption less than a two-price plan producing the same enhancement of farm income. Applying the same tests as those applied to the two-price plan, there also appears to be a net loss to the community, subject to the gains, if any, from internal transfers. The losses, however, appear less than with the two-price plan. The domestic subsidy expands domestic consumption and lowers consumer expenditures. There is a gain to domestic consumers and it appears there may also be a net gain to the domestic economy in some instances. If it is good public policy to increase farm incomes, then the advantages appear to lie with the method of domestic subsidies, which give favorable treatment to domestic rather than to foreign consumers.

Among the subsidies, the domestic subsidies require the largest payment from the treasury for a given enhancement of farm income. In fact, the treasury payments exceed the increase in income by farmers. Since the costs of a program may be judged by the public more from the visible than from the invisible costs, this may count against a domestic subsidy from the farm viewpoint. The export subsidy payments from the treasury are less than the increase

in farm income, whereas those of a general subsidy are equivalent to it.

All of these plans by enhancing farm income above market levels may be expected to expand production above free market levels unless control measures are instituted. As output expands, the average price received by farmers declines, although at a rate somewhat slower than under free market. Prices will eventually fall until all the gains are lost. All of the plans are thus only of temporary advantage unless accompanied by other measures.

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AN APPROACH TO THE DETERMINATION OF INTRASEASONAL SHIFTING OF DEMAND

THE question at issue in this note is whether changes in price of a perishable product during its marketing season represent intraseasonal movements along a single seasonal demand function or a systematic pattern of intraseasonal shifts of the demand function itself.¹ The problem assumes peculiar importance in the administration of orderly marketing or market control programs by which the quantities shipped in each week or lesser period are centrally controlled. However, to the degree to which it is possible to adjust timing of shipments, intraseasonal demand movements are important to all shippers. If demand varies within a season, knowledge of those shifts is essential to maximizing returns from the intraseasonal distribution of a given volume of product. Further, if the demands in various parts of the season are temporally interdependent, careful distribution in the various parts is even more important.

There have been many programs in many commodities in which the flow to market has been centrally regulated either on a voluntary basis or by industry-wide controls sanctioned by state or federal laws. The factors affecting the seasonal level of prices of these commodities have in general been well described. However, there has been little effort made to develop empirical descriptions of weekly price variations even in those instances in which the controls have explicitly governed weekly shipments. Lack of data has

¹ The authors are indebted to Dr. George M. Kuznets for advice and assistance throughout the preparation of this paper.

been one of the major reasons for this deficiency, and as yet there is little theoretical basis by which research relevant to short-run price changes can be guided. Thus, one of the major considerations on which short-run control should rest remains unexplored.

This inquiry arose from observance of a remarkable stability in the crude patterns of price change within single seasons of several perishable products. In general, as the season begins, price is very high and the quantity moved is very low. In the first few weeks of the season, price decreases steadily as sales increase. Then a reverse movement begins in which price rises as volume diminishes; but nearly always the price for a given volume is lower than in the early phases of the season.² Inspection of these price-quantity relationships led to the hypothesis that for some of the highly perishable products, at least, there was a systematic change in the slope and level of weekly demand as the season progressed. However, relatively higher prices in any phase of a marketing season of themselves do not evidence higher demand than that which prevails in other stages of the season. Different prices in the different periods may merely represent varying quantities sold on an unchanging demand function. To demonstrate that intraseasonal shifts actually occur, it must be shown that intraseasonal price variations cannot be explained by simultaneous variations in the quantity put on the market.

There are several ways by which this hypothesis can be tested statistically. The data may be divided into relatively short periods (say weeks) for each of the seasons and the periods numbered. These and other variables believed to be related to price variations can be introduced into a multiple regression equation. In this model, it is assumed of course that within seasons and between seasons the demand curves shift in a parallel manner; that is, that only the level and not the slope of the demand curve varies within and between seasons. Or various series might be lagged in accordance with some hypothesis as to serial relationships among the factors. Functions linear in the logarithms of one or more variables might be used to permit a single estimate of elasticity or flexibility coefficients for the various factors.

Another way of examining the hypothesis of intraseasonal shifts of demand, and the one which we have employed in this note, is to

² The behavior of strawberry prices and receipts in the San Francisco wholesale market in the period 1935-1940 is a striking example of this phenomenon.

fit separate functions to the data for each week. The major weakness of this method is the fact that the possibilities of serial interrelationships among the factors cannot be explored. However, no restrictions are imposed on the nature of the intraseasonal shift. Both the level and the slope, and in fact, the form of the demand functions are left free to vary from week to week.

The Hammond, Louisiana, strawberry deal was selected for analysis as a preliminary test of our hypothesis primarily because comparable data on daily shipments from Louisiana, daily weighted average f.o.b. cash track auction prices, and daily total United States shipments as far back as 1924 were available. The price series used is a weighted average price for all offerings and is apparently representative of virtually the entire movement from Louisiana.³

The strawberry industry as a whole is made up of a large number of short-season operations running from the early deals of the southern states to the late fall areas which supply berries for short periods after local supplies are off the market. In most of the specialized production areas, the short season commences with a few scattered shipments, and then gradually swells to a flood of shipments at the peak of the movement, after which shipments gradually decrease. In the case of the Louisiana deal, total United States shipments continue to increase after the close of the season. But during the peak of the Louisiana season, such shipments comprise the bulk of United States shipments.

The annual period in which Louisiana shipments are a significant part of total United States volume has varied in length from six to eleven weeks. The beginning of movement in large volume has varied from the last week of February to the first week of April. Similarly the peak of shipments has varied over the years, and there has been little regularity in the time of commencement or the volume of movements from competing areas. The status of any given calendar week therefore varies widely from season to season. Division of the season into weeks on a calendar basis would mean that the same week might in one year fall near the peak of volume and in another near the beginning or the ending of the season.

³ Comprehensive descriptions of the Louisiana deal are available in United States Bureau of Agricultural Economics, *Factors Affecting Returns to Louisiana Strawberry Growers*. Washington, D. C., 1934, and United States Bureau of Agricultural Economics, *Market Distribution and Price Spreads of Louisiana Strawberries*, Washington, D. C., 1938.

For these reasons, we have used a different method in laying off the seven-day periods which are used as weeks in this analysis. Weeks were numbered by counting off successive seven-day periods in each season after sustained shipments in fairly large volume from Louisiana had commenced. Thus "Week IV" in the analysis is a series of seventeen seven-day periods in which Sunday falls anywhere from the first to the last day in the week, and ranges from mid March in 1927 to late April in 1940. Hence "Week IV" in each year represents the fourth week of the Louisiana deal in respect to total United States shipments. Weighted average prices for each of these market weeks were computed from the weighted average daily prices of the relevant seven days. Total United States shipments for each of the market weeks are the aggregates of total daily United States shipments in each one of the weeks. The income variable was the April value from "Non-agricultural Income Payments. United States, 1919 to date" (seasonally corrected indexes, 1924-1929 = 100), Bureau of Agricultural Economics, September 3, 1940.

The degree of personal judgment involved in laying off the several weeks over the seventeen years is recognized. However, a calendar classification was impossible. Both prices and income were used in current dollars, and neither the shipment nor income series was reduced to a per capita basis. In using total rather than per capita income, the effects of variation in per capita income and the change in the number of income recipients or consumers are not separated but their combined influence is taken into account. Since a measure of aggregate income was used, total rather than per capita shipments were also used.

Table 1 summarizes the statistical explanation of factors affecting weekly prices. For all weeks the weighted weekly average of weighted daily average f.o.b. prices of Louisiana strawberries is the dependent variable and is expressed as a linear function of total United States shipment, Louisiana shipments or "other shipments" of strawberries, of nonagricultural income or the square of it, and of "time." Functions were fitted by least squares. While the choice of the function is quite arbitrary, it is simple to calculate and appears to fit the data satisfactorily. With the exception of "Week VII" adjusted coefficients of multiple correlation range from .90 to .98. Examination of net regression charts for "Week VII" as well as for the other weeks indicated that no marked im-

TABLE 1

LOUISIANA STRAWBERRIES: PRICE REGRESSION ANALYSIS¹ BY
WEEKS OF SEASONS, 1924-1940(Figures in parentheses are ratios of regression coefficients to standard errors)²

Week of season	Number of observations	Regression coefficients ^a							Adjusted coefficient of multiple correlation
		Constant term	Total shipments <i>q</i>	Louisiana shipments <i>qL</i>	Other shipments <i>q_o</i>	Nonagricultural income		Time <i>t</i>	
						<i>r</i>	<i>r</i> ²		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
I (a)	14	2.3392	-0.0042 (7.34)			0.0202 (3.34)		-0.1988 (11.79)	0.9733
(b)		2.3408		-0.0042 (5.47)	-0.0043 (3.82)	0.0202 (3.17)		-0.1987 (11.17)	0.9703
II (a)	15	3.6153	-0.0029 (10.95)				0.0207 (7.01)	-0.1319 (9.44)	0.9778
(b)		3.7985		-0.0023 (6.33)	-0.0044 (5.07)		0.0201 (7.43)	-0.1434 (10.10)	0.9817
III (a)	17	1.4173	-0.0027 (4.90)			0.0308 (3.43)		-0.1262 (5.26)	0.9235
(b)		1.4142		-0.0025 (2.82)	-0.0031 (2.18)	0.0308 (3.40)		-0.1316 (4.71)	0.9221
IV (a)	17	6.1940	-0.0018 (5.16)					-1.5499 ^d (7.56)	0.9059
(b)		6.1523		-0.0020 (3.21)	-0.0016 (3.32)			-1.4946 ^d (5.96)	0.8996
V (a)	17	0.7671	-0.0016 (6.21)			0.0344 (4.05)		-0.1141 (4.96)	0.9194
(b)		1.0097		-0.0023 (4.26)	-0.0010 (2.35)	0.0331 (4.04)		-0.1105 (4.97)	0.9260
VI (a)	17	2.4141	-0.0016 (9.69)				0.0198 (5.36)	-0.1517 (8.53)	0.9637
(b)		2.5419		-0.0020 (5.34)	-0.0015 (8.87)		0.0196 (5.49)	-0.1484 (8.51)	0.9662
VII (a)	15	0.4591	-0.0006 (2.39)				0.0270 (3.78)	-0.0973 (3.03)	0.8079
(b)		0.3040			-0.0009 (3.05)		0.0286 (4.39)	-0.1198 (3.70)	0.8450

¹ The equations are of the form $p_t = a + bq + cr + dr^2 + et$ where p is weekly weighted average of daily auction prices of Louisiana strawberries.² t at the 5 percent level is 2.145 for 14 d.f., 2.160 for 13 d.f., 2.201 for 11 d.f., and 2.228 for 10 d.f.³ q = United States shipments of strawberries, in cars. qL = Shipments of Louisiana strawberries, in cars. qo = Shipments of other than Louisiana strawberries, in cars. r = Index of nonagricultural income for April of each year (1924-29=100). t = time in years; origin, 1933.⁴ Discontinuous trend; $t=c$ for 1924-1932, and $t=\lambda c$ for 1933-1940.⁵ Louisiana shipments in Week VII are not significantly related to price.

Note: Basic data were obtained largely as follows:

1924-1925, U.S.D.A., Bur. Agr. Econ., Division of Fruits and Vegetables, Louisiana Strawberry Deal, Annual Reports.

1926-1940, U.S.D.A., Bur. Agr. Econ., Division of Fruits and Vegetables, Marketing Louisiana Strawberries, Annual Reports, except 1933 which was obtained from Special Release, Preliminary Review of the 1933 Louisiana Strawberry Season, May 8, 1933.

1924-1939, U.S.D.A., Bur. Agr. Econ., New York Miscellaneous Fruit and Vegetable Reports, daily.

1940, U.S.D.A., Agr. Marketing Service, New York Miscellaneous Fruit and Vegetable Reports Daily.

provement in fit could be expected from changes in the form of the net regressions.

The choice of price as the dependent variable is also arbitrary. However, since the effects of reservation demand are limited by the extreme perishability of the product, the direction of the relation is clearly from quantity to price. It is not necessary, however, that the direction of relation should be the factor determining the choice of the direction of minimization. At any rate, the method employed in calculating the least squares estimates of the coefficients permitted the use of shipments or any other factor as the dependent variable without a great deal of additional calculation.⁴ For all weeks, inferior fits were obtained with shipments as the dependent variable. The *t*-statistics, that is, the ratios of the regression coefficients to their standard errors in all instances exceed at least the value of *t* at the five percent level of significance.

It will be noted in Table 1 that in the (a) equations for the various weeks, Louisiana prices were related to total United States shipments. The (b) equations relate Louisiana prices separately to Louisiana shipments and shipments from other areas. The net regression coefficients of price on total United States shipments, on Louisiana shipments, and on shipments from other areas during the Louisiana season do not differ greatly. Similarly, the total fits of the two types of equations indicate that little if any improvement in the explanation of variations in Louisiana prices is obtained by separate consideration of Louisiana shipments.

Moreover, in the course of the analysis the hypothesis that the coefficients of shipments of Louisiana strawberries and of shipments of other strawberries have the same value was tested. On the basis of this test it may be concluded that a given quantity of strawberries other than those originating in Louisiana has the same effect on Louisiana price as does the same quantity of Louisiana shipments. Further evidence in support of this conclusion would require use of prices for strawberries shipped from other areas, which prices are unfortunately not available.

It is seen that for some weeks the square of income and for others income to the first power was employed. In "Week IV" in-

⁴ The computational techniques employed involved the calculation of the inverse of intercorrelations between all variables for each week. The complete set of multiple correlation coefficients may be obtained directly from the diagonal elements of the inverse.

come was omitted altogether. The only explanation of these uses of the income factor is that they lead to better fits of the respective equations. Probably there is little significance in the fact that for "Weeks I, III and V" income, and for "Weeks II, VI and VII" income squared appeared to be the appropriate variables.

For all weeks the trend of demand over time was downward. In "Week IV" a discontinuous time trend was employed.

However, the major interest of this note is not in the statistical

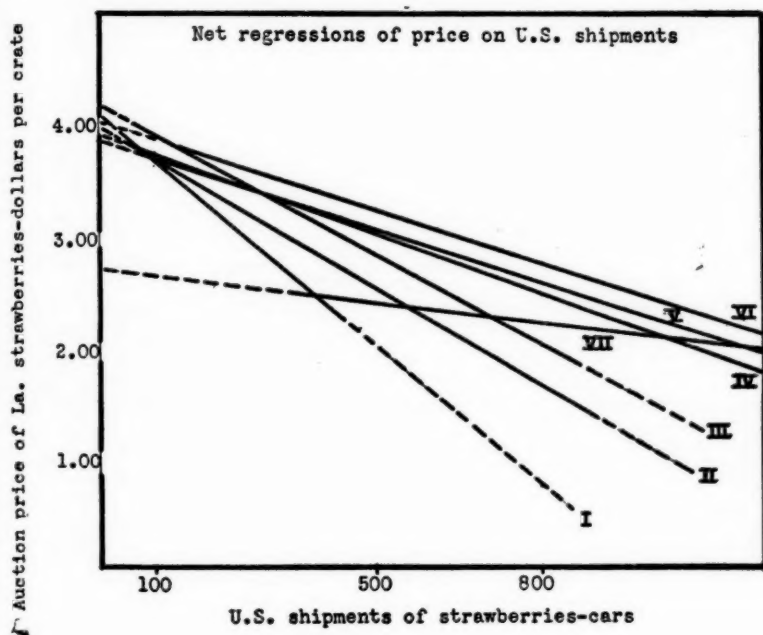


FIG. 1

methodology employed. What is of concern is the pattern by which weekly demands appear to shift as the season progresses. This information is summarized in Table 2 and in Figures 1 and 2.

In Figure 1 the net regressions of Louisiana price on total United States shipments are shown. The level of these regression lines is placed, in conformity with the usual procedure, so that each line passes through the centroid of prices and shipments of the relevant week. The heavy lines are also drawn only for the range of ob-

served shipments within each week of the period under consideration, so that this range can be determined at a glance.

In Figure 2 the net regressions of price on Louisiana shipments are shown, and, as in Figure 1, each line passes through the centroid of prices and shipments for the relevant week. Similarly, the heavy lines are extended only over the range of observed shipments. Regression equations for "Weeks I" through "VI" only are shown.

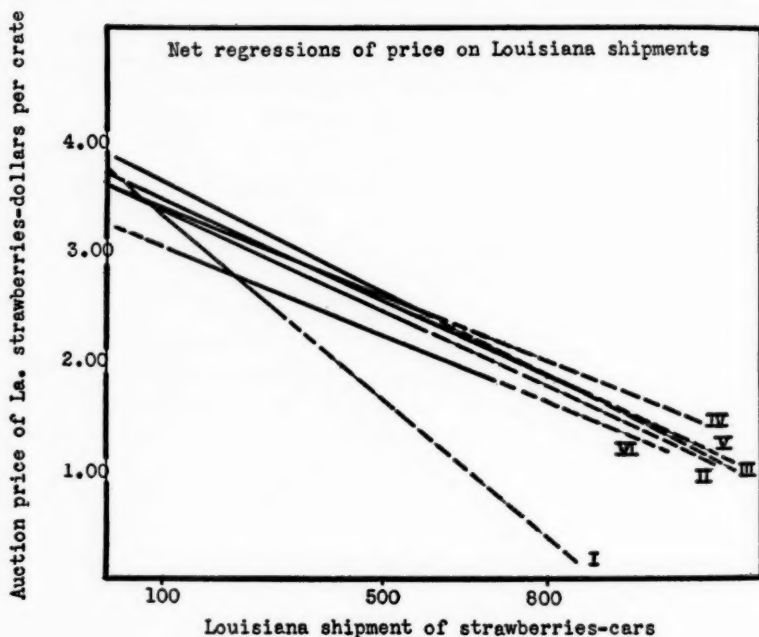


FIG. 2

Louisiana shipments were not significantly related to price in "Week VII" as is indicated in Tables 1 and 2.

It is possible and even probable that as a result of the small number of observations, the differences between the slopes of these lines, with the possible exception of the equations for "Weeks I and VII," are not significant. The statistical significance of these differences was not tested. But the important fact about Figure 1 is not the magnitude of differences among the slopes but rather the orderly fan-shaped arrangement of the regression lines. The striking fact is the systematic decrease in slope from week to week as the

season progresses. The probability of the purely fortuitous occurrence of this stable pattern seems indeed small. It is evident from inspection of the regressions in Figure 1 that either for constant shipments or for constant price, elasticity of demand increases as the season advances.

When Louisiana shipments are considered separately, as in Figure 2, a somewhat different pattern appears. The slopes of the demand functions decrease markedly after the first week, although the consistent decrease from week to week is not manifested. The

TABLE 2

LOUISIANA STRAWBERRIES: NET REGRESSIONS OF PRICE¹ ON TOTAL U. S. SHIPMENTS AND LOUISIANA SHIPMENTS BY WEEKS OF SEASONS, 1924-1940

Week of season	Constant term	Regression coefficients		Week of season	Constant term	Regression coefficients	
		Q^2	Q_L^2			Q^2	Q_L^2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I (a)	4.1013	-0.0042		IV (a)	3.9147	-0.0018	
(b)	3.7312		-0.0042	(b)	3.5812		-0.0020
II (a)	3.9692	-0.0029		V (a)	3.8474	-0.0016	
(b)	3.5931		-0.0023	(b)	3.6760		-0.0023
III (a)	4.1703	-0.0027		VI (a)	4.0330	-0.0016	
(b)	3.8644		-0.0025	(b)	3.2166		-0.0020
				VII (a) ⁴	2.6818	-0.0006	

¹ Prices are weighted weekly averages of Louisiana daily auction prices per 24 pint crate as reported in Bureau of Agricultural Economics daily and summary reports.

² U. S. Shipments of strawberries, in cars.

³ Shipments of Louisiana strawberries, in cars.

⁴ Louisiana shipments in Week VII are not significantly related to price.

level of demand appears to rise through the fourth week and thereafter declines. However, the statistical evidence indicating that there is little difference in the effects of Louisiana or other shipments on Louisiana price implies that the pattern shown here is less representative of actual demand conditions than that shown in Figure 1.

Several interesting issues are raised by these results. The first is the degree to which this systematic pattern of demand movement is an artifact either of the data or the method of analysis or of both. The degree to which the selection of the initial hypothesis affects the results is also implicit in this consideration. Thus these conclusions suggest that further analysis employing both these and other data should be undertaken. Using these same data, it is possible that equally good total fits might be obtained if various types of

restrictions as to the movements of the demand functions from week to week and season to season were imposed. Laying off the weeks on a basis different from that used here, or using either shorter or longer periods than a week could also lead to differences in conclusions. Expression of some of the variables in logarithms would imply a different hypothesis as to elasticities. Lagging of one or more of the variables would offer a test of the temporal interrelationships of price and quantity. These questions relate to the degree to which the equations set forth in Table 1 actually describe the intraseasonal movement of demands for this product.

Of perhaps even greater interest is the question of the degree to which the apparently significant relations shown here are general to other commodities and to other areas. This question can be answered only by submitting short-run price and quantity data for other commodities or for this commodity in other areas to similar tests.

Taking the above equations as representative of the movements of intraseasonal demand for Louisiana strawberries, appraisal of the movement pattern of Louisiana shipments as it affects returns to growers becomes possible.

There is some *a priori* basis to expect the orderly shifts shown in Figure 1 and, perhaps to a lesser extent, those shown in Figure 2. At present there is virtually no well developed theory of short-run demand variation. It is suggested that empirical studies directed towards these problems may contribute greatly to this gap in economic generalizations, and at the same time provide information of great value in the actual functioning of market agencies.

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TAILORED CREDIT FOR LAND IMPROVEMENTS¹

THE occasion for the writing of this brief article is the recent publication by the Federal Reserve Bank of St. Louis of an important pamphlet under the title "Bank Credit for Soil Conservation." The first printing of this was exhausted within a month after its appearance last October. The author is Darryl R. Francis,

¹ Mr. Francis has made some very useful comments on this article since it was first submitted to the JOURNAL. These have been taken account of in some small measure in the final revision of the article, but mainly included in footnotes. This is Publication Number 17 in the publication series of the Seminar on Agricultural Policy in the Littauer School of Public Administration.

Agricultural Economist on the research staff of the St. Louis Bank, but he had the assistance of Mr. Webb Embrey, the County Agent of Buchanan County, Missouri, in which is located the farm which furnishes the principal example used in this study, of Mr. Sid B. Johnson, Conservation Contractor, of several members of the St. Joseph Chamber of Commerce, and of several members of the staff of the Missouri College of Agriculture. Mr. Francis formerly lived in St. Joseph. The University of Missouri furnished the data for the other farm used as an example, a farm in the Missouri Ozarks. Chester C. Davis, President of the St. Louis Federal Reserve Bank, supplied an excellent Foreword.

The great merit of this pamphlet is that it outlines a definite procedure with all the necessary legal forms, including the application form, mortgage or deed of trust, and schedule of advances and repayments, for a loan to be made to finance a program of land improvements. The particular programs of land improvements outlined include construction of grassed waterways, terraces, outlet structures, diversion ditches, stock ponds and fences, and lime, fertilizer and grass and clover seed—a program of the sort that is ordinarily laid out in a Soil Conservation District as a “water management” program. However, it could also include any of the following: clearing land of trees, brush, stumps or stones; pasture improvement in general; drainage; weeding, thinning, improvement cuttings and other forms of woodland improvement; and even a certain amount of tree planting.

The work program is laid out by years, a plan for 1945, 1946, 1947, 1948, etc., together with the cropping system for each year. In the case chosen for the principal example, the construction work is all to be completed in three years. The plans for 1948 and the remaining 6 years before the loan is finally liquidated consist only of annual advances of fertilizer. The advances each year are added to the first mortgage on the farm. The mortgage is thus increased without the usual re-writing, following a practice that is coming into favor in the housing field and elsewhere. The mortgage is thus in two parts, with two separate schedules of repayments. In the example used, an amortized first mortgage for 60 per cent of the appraised value of the farm is assumed. The annual payments on his purchase loan are \$545. The repayments on the land-improvement part of the loan are 75 percent of the estimated increased income resulting from the improvements. They begin with \$195

for the first year's improvements, consisting mostly of constructing grassed waterways, and rise to more than \$1400 for the years 1949 to 1952. The increased productivity of the farm is estimated at around \$2000 from 1949 on. The conservation part of the mortgage is scheduled to be redeemed in nine annual payments.

The intent of this article is not to report upon this proposal—anyone at all interested in agriculture needs to get a copy of this pamphlet and study it closely. It is rather to suggest a number of changes and supplements that will make more workable any similar proposals that may be made by other banks. It is reported that officers and staffs of other Reserve Banks, of insurance companies making loans on farms, of associations of commercial and farm mortgage bankers, and even of the FCA, have become much interested in this plan proposed by Mr. Francis and the St. Louis Bank and are asking how it can be adapted to the conditions under which they operate. Following are numbered in logical sequence the more important of these suggestions. (1) The procedures outlined in this pamphlet need to be outlined in terms of conditions and probabilities on the *ordinary run of farms* in an area. The farm used as the principal example in this pamphlet was valued at \$22,695 before the improvements were made, and the cash expenditures on the improvements were \$9714, including interest. The expenditures over the nine years include \$832 for $1\frac{1}{2}$ miles of grassed waterways, \$2296 for 13.8 miles of terraces, \$1119 for outlets, \$450 for ponds, \$1525 for fences, \$1083 for lime, and \$1532 for fertilizers. The farm was reappraised after the improvements were made at \$31,572. Readers will agree that only the very exceptional farmer with a 60-per cent mortgage on such a farm would go into debt to the extent indicated to install a water-management system on his farm. Mr. Francis carefully warns against transferring the land-improvement plans prescribed for this farm to other areas with different land-improvement problems—points out, in fact, that in “other areas much less construction work would be required” and that nothing more than proper crop rotation, liming and fertilization might suffice in some. But he does not outline a program and schedule of advances and repayments for such a situation. His pamphlet would be more useful in other areas if he had.

The report on the farm in the Ozarks does not include a detailed credit plan. It merely outlines the history of the farm since 1924, when the present owner assembled it out of two tracts of worn-out

land, and then gradually brought it back into productivity; but especially its much more rapid improvement after 1937 when it adopted a "complete" farm plan. Bank credit has been used from time to time over the years since 1924. Its net cash receipts were almost trebled between 1937 and 1941.

(2) In keeping with foregoing, the land improvements on the St. Joseph farm are all paid for on a cash basis. They are hired at "contract" rates. On the ordinary farm, most of the labor will be done by the farmer himself. Borrowing money to have an extensive system of waterways, terraces and outlets built will not appeal to most farmers. (Hiring terracing done with special equipment will be an exception to this statement on many farms in some areas.²

(3) It also follows that if the farmer does much of the work himself, making advances on a cash-cost basis means advances for much more than the cash outlays. Most farmers in ordinary times will want to borrow only to cover cash costs.

(4) In practice, also, many farmers will not want to borrow to finance all of the work on a "complete" farm plan. They may want to borrow only to drain some part of the farm or to clear a field, or to establish a field of kudzu, or to improve a stand of timber, or to contour-ridge and improve a permanent pasture in a long sloping field. Loans for such limited purposes are just as useful as those based on full farm plans.

(5) In practice, again, commonly it is not wise on an ordinary farm to push the improvement program as rapidly as on the two farms described in this pamphlet. In the first place, this requires that much more of the work be hired. Given five or six years in place of three to carry out a program of terracing and pasture improvement, only grass and clover seed, lime, fertilizer, and fencing supplies may need to be paid for in cash.³

In the second place, and perhaps more important, most revised

² Mr. Francis states that this farm differs only in size from the typical farm in the area around St. Joseph; and says that most of the farms in this area need this much construction work. He admits that "to borrow for such purposes will not appeal to a high percentage of farmers at the present time." However, two conservation contractors are being kept very busy in the county, and the attendance at the February annual meeting of the Missouri Conservation and Terracing Association was 275. Mr. Francis states that the main purpose of the booklet is to show that farmers can afford to borrow even to hire all the work done on such a farm.

³ Mr. Francis indicates that in this particular area where heavy equipment is needed for the work, and ordinarily needs to be hired, getting the job done as soon as possible is the best economy. The writer would concede this, but insist that this is not the usual situation in the United States.

farm plans provide more pasture, forage and cattle, and experience shows that in practice the herds do not expand fast enough to keep up with the increase in feed and forage. This was brought out forcibly in a study made in 1940 of progress on a group of TVA unit-test-demonstration farms in Tennessee.⁴ The cheapest way to increase herds of cattle is to raise more heifer calves, and this takes time.

(6) Or if the livestock herds are to increase as need be to utilize the increase feed arising from a drastic improvement program, in many cases the loans may need to include purchase money for livestock and perhaps for equipment. Mr. Francis makes mention of this, but no provision for it. Lack of capital and credit was one of the reasons for the lag on the TVA farms.⁵

(7) The plans outlined in the pamphlet for the first three years do not include the livestock that is to utilize the feed. All we are told is that "beginning in 1948," which is four years from the start in 1944, "the crop and livestock programs in the original balanced plan will be under way," and what the final livestock program is to be. Now if the increases in feed and forage resulting in 1945, 1946, and 1947 are to be fed to livestock, we need to know what livestock, and the expected receipts from sale of livestock and livestock products, for it is upon these that ability to repay depends.

(8) Neither do the plans present a full statement of the crop production. As nearly as can be ascertained from the pamphlet, the cropping plans of the farm in the five years are about the following.

	1944	1945	1946	1947	1948
Corn	76	50	55	64	54
Wheat	31	0	0	27	27
Oats	10	63	49	54	54
Hay	39	43	64	22	21
Rotation pasture	12	12	0	0	12
	<hr/> 168	<hr/> 168	<hr/> 168	<hr/> 168	<hr/> 168

The pamphlet reports that 27 acres of corn in Field J in 1946 would yield 15 more bushels of corn per acre; but the remaining

⁴ *Progress and Possibilities for Further Progress on Fifty Unit-Test-Demonstration Farms in the Valley of East Tennessee*, Tennessee Agricultural Extension Service.

⁵ Mr. Francis says that this farm had been recently purchased and the farmer was not yet ready to work out the livestock program, except perhaps to buy stocker cattle to use up any extra feed that would be produced. He also says that the subject of operating capital credit for such purposes as buying producing cattle is being handled in another booklet. It is obvious, of course, that repayments on a real estate mortgage and on loans for operating capital need to be carefully integrated even though financed with separate credit instruments. One farm plan should cover both.

23 acres of corn should yield no better than before because no terracing or liming has been done to them. The total corn production of the farm would be down 775 bushels, according to data on average yields supplied in the report. The additional 53 acres in oats should produce 1540 bushels more oats, but 560 bushels of wheat will be lacking. It is obvious that not until all of these increases and decreases are balanced against each other can one know whether the farm has any increased income out of which to make payments on an increased debt. The 1946 plan also has no wheat and runs strongly to hay and oats. These shifts were necessary in the process of getting the land terraced, but they may have reduced the farm income for the first one or two years. In fact, drastic changes such as proposed for this farm are likely to do so.

(9) The foregoing adds up to the statement that a full *budget of expected sales receipts and expenses*, that allows for changes in acreages as well as of yields, and for all crops, and for feeding the feed and forage crops to livestock, is needed for each year, before any definite amount of repayment can safely be scheduled any year. Failure of Mr. Francis to present such budgets may have arisen from the fact that farm plans developed by the Soil Conservation Service rarely do so, including only estimates of increased yields on fields receiving treatment, and nothing about livestock receipts; or it may reflect the tendency of farm appraisers generally to base "normal" value mainly on crop yields.

(10) More important even than the foregoing, farm planning involves much more than planning physical land improvements. It calls for balancing against each other the most promising cropping systems and accompanying livestock systems. The livestock system set up for the St. Joseph farm calls for 10 dairy cows, 15 sows to farrow two litters each year, and buying 40 to 60 feeder calves in the fall, roughing them through the winter, and selling them off grass the following summer. Perhaps Mr. Francis carefully estimated the probable income from this livestock system, and cropping system to go with it, and that of several other combinations, but his presentation surely does not suggest it. What it suggests instead is that a physical plan was laid out that seemed ideal from the standpoint of soil and water conservation, and then a livestock system was chosen that would consume the combination of concentrates and roughage that would be produced, probably following closely in the latter the prevailing patterns in the area, the preferences of the particular farmer, and the like.

(11) Such a procedure as just outlined tacitly assumes that a program that is excellent from a soil conservation standpoint is also best from the standpoint of use of human and other resources. It overlooks the fact that most land can be maintained at a wide range of *levels of productivity*. A Wisconsin dairy farmer, for example can follow a program that includes much alfalfa and corn silage, supplemental protein feeding, rotation pasture, some lime and phosphate, a few hogs, and 40 milk cows; or one with less alfalfa and silage, more oats and more hogs, and only 15 milk cows. The land will be on a considerably higher level of productivity in one case than the other. The plan outlined for the St. Joseph farm presupposes that a high level of productivity will pay best. A much less intensive system could be devised that would still suffice to check erosion, and might fit better into the general economic situation.

What determines the level of productivity that is best? Often it is nothing more than the amount of land available. Given a relatively small acreage, a particular farmer may find that his best alternative is to raise the level of productivity of what he has. Or having inherited a larger acreage than he wants to farm intensively he may follow the opposite course. How much hired labor a farmer is able to hire or manage well may be the determinant. But in the aggregate, the state of the demand and supply for the farm products of an area will be the most important. In areas supplying fluid milk markets, for example, the amount that can be sold at Class I prices keeps more farmers from raising the productivity level of their farms. Credit plans therefore call for market analysis as well as for effects on yields.⁶

(12) Land-improvement credit for timber-stand improvement, drainage, irrigation, and other things not falling within the usual description of soil or water conservation is also important. It is extremely easy to spend money on these that is not warranted; or to lay out a plan for them that is too costly or ambitious. Timber-stand improvement, for example, is possible over a wide range of intensities, yields, and types and qualities of product.

⁶ This discussion appears "theoretical" to Mr. Francis. Perhaps it should have been pointed out in addition that if the near doubling of output on this St. Joseph farm were to be extended to all farms in similar condition, by the methods best suited to each, the agriculture of this country would indeed have a "surplus" problem. The reason for the low levels of productivity prevailing in much of the farm land of the United States is that higher levels depress prices unduly. It is always possible to show that the farms in some limited area producing for a wide market will gain by raising their productivity level—provided other areas do not do the same or equivalent things at the same time.

(13) Mr. Francis is surely too optimistic in the following statement: "The college of agriculture of every state has sufficient background data of this type to make it possible to work out a program in which anticipated increases can be based on actual results, which pretty well takes the guess out of planning and makes it possible for a farmer to proceed with reasonable assurance of results so long as he follows the recommended practices worked out in the plan." The writer's experience is that rarely is the information fully adequate for a good job of farm planning and working up budgets on which to base schedules of loan advances and repayments. Occasionally some experimental data are available that fit a situation closely, but such results need usually to be discounted for actual farming conditions, sometimes as much as a third or a half. The writer suspects some discounting is needed for those used by Mr. Francis.⁷ The more usual situation is that only crude averages are available, and these need to be adapted a good deal to fit the farm being analyzed. The record of repayments on tenant-purchase loans has been good in spite of the size of the loans, and the quality of the budgeting is a large factor in this result. When payments have not been met, miscalculations because of inadequate data have been a principal reason for it.

(14) If land-improvement loans are to be used increasingly, more farmers are going to need more help in budgeting and planning. Many banks can afford to take a hand in this. The agricultural extension service needs to increase its facilities for such service, partly by training its staff for it, partly by developing more efficient methods of training farmers to plan their own operations, and partly by adding farm specialists to their staffs. An ideal arrangement would be to have extension agents help farmers work up farm credit plans that the farmers could offer to their local banks for financing, or to the PCA's or Land Banks if necessary, or to the FSA in some cases. It should be clear by now that something more than a water-management plan is needed.

(15) The procedure of adding land-improvement loans to first-mortgage loans is not the only one possible. The FCA would probably find the use of second mortgages fitting better into its methods of operating, and this might be true of some private agencies.

⁷ Mr. Francis says that the University of Missouri specialists consider his estimates conservative. The writer does not doubt that these and more *could be* attained; but doubts whether they *would be* on the average farm. On the 50 TVA farms to which reference was made above, only 6 exceeded conservative estimates of this kind, and a half failed to achieve them by sizable margins.

(16) Such loans can in many cases be combined to advantage with loans to acquire additional land to round out an economic unit. Such land often needs rehabilitation. There is much scattering timberland in this country that could well be brought within the boundaries of existing farms and made more productive.

(17) Finally, although normally a land-improvement loan should not include an allowance for labor done by a farmer on improving his own farm, there may be situations in which the need for current income is such that the farmer, or members of his family, are forced to work outside the farm, when it would be better for them if they were able instead to devote their time to building up the productivity of their farms, so that five or ten years later they would be able to earn a sufficient income at home. Such loans are feasible, in the writer's judgment, if they are carefully made. The advances should be for not more than half of the work done, and it needs to be checked carefully.

As a technique for the latter, the writer would propose the following: As part of the plan, designate a definite number of days work, for man, and man and team, for each operation, and a definite loan advance to cover it. The farmer would then know in advance what loan advance he would get. The checking of the work would be no different than if it were done by contract labor.

Conceivably, also, a program could be developed of combining government grants, such as the payments in kind made by the AAA, or the income-deficiency payments now being proposed, with loans made by private or public credit agencies. Any payment in kind for lime, fertilizer, grass seed and the like, or deficiency payments worked out in land improvements, would make more bankable a loan to cover additional outlays. Credit might in this way be made to carry a considerable part of the immediate burden of reconverting Southern agriculture.

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AGRICULTURAL ECONOMISTS' VIEWS ON FARM PRICE POLICY*

A SURVEY of 728 members of the American Farm Economic Association was made in December 1945 to determine their views on a desirable type of farm price policy and to find out on

* Survey made by Committee on Parity Concept, American Farm Economic Association.

what method of price or income support they would place the greatest emphasis. The following summarizes the views of 305 agricultural economists on these questions.

<i>The Question</i>	<i>The Answer</i>	
I. Which of these statements <i>most nearly</i> expresses your views concerning a desirable governmental farm price policy for the post-Steagall period:	Number	Percent
(a) Government should maintain prices (either in the market or by supplementary payments) of all farm products at 90 per cent of their respective parity prices (as now calculated) or higher.	11	4%
(b) Government should support the prices (or market prices plus payments) of principal individual agricultural commodities at levels announced in advance, these levels being adjusted to prevent sudden changes in farm income and to reflect gradual changes in the cost of production and in demand for individual commodities.	123	40%
(c) In periods of prosperity the Government should support neither farm prices nor farm income. In periods of depression it should support over-all or net farm income without supporting prices of individual farm products.	113	37%
(d) The Government should withdraw completely all price or income supports, limiting their activity in the price field to the furnishing of improved market news reports, statistical analysis of factors affecting prices, and outlook reports to be used by farmers in making their own decisions.	58	19%
Total	305	100%

<i>The Question</i>	<i>The Answer</i>	
II. In case you favor any form of price or income support, on which of the following methods would you place the <i>greatest emphasis</i> (that is, in terms of the relative importance of the products):	Number ¹	Percent
(a) Government purchase of surpluses from producers or processors to prevent the market price from falling below the support level.	27	8%
(b) Payments direct to farmers to make up the difference between the announced <i>support level</i> and the <i>market price</i> .	97	30%

¹ A few checked more than one, indicating equal emphasis on several of the alternate choices.

(c) Subsidized consumption programs such as those proposed in the Food Allotment Plan or Food Stamp Program	123	37%
(d) Other.	29	9%
(e) No replies (largely those who favored no support program. See Question I)	54	16%
Total	330	100%

Less than 4 per cent of the agricultural economists voted continuance of the existing government program which provides support of prices at 90 percent of parity or higher. Over three fourths of the economists favor either a plan for the government to support

AGRICULTURAL ECONOMISTS' VIEWS ON PRICE POLICY

Question I in Brief ¹	Views by Regions					Views by Occupational Groups			
	North Atlantic	District of Columbia ²	North Central	South	West	College	Government	Business	Other
(a) Government should maintain prices of all farm products at 90% of parity or higher.	1	2	4	1	3	3	4	2	2
(b) Government should announce support price levels in advance, but these levels should be adjusted to reflect gradual economic changes.	14	37	37	21	14	34	53	10	24
(c) The Government should support farm income (not prices) only in periods of depression.	9	23	55	9	17	53	37	12	11
(d) The Government should withdraw completely all price or income support.	17	6	22	9	4	26	9	11	12
Total	41	68	118	40	38	116	103	35	49
Question II in Brief¹									
(a) Government purchase of surpluses to prevent the market price from falling below the support level.	3	7	11	4	2	8	11	4	4
(b) Payments direct to farmers to make up the difference between the support level and the market price.	8	25	32	16	16	33	36	13	15
(c) Subsidized consumption programs.	12	35	50	12	14	42	52	7	22
(d) Other	2	5	12	7	3	17	7	3	2
(e) No report	16	6	19	7	6	23	10	10	11
Total³	41	78	124	46	41	123	116	37	54

¹ See above the exact statement of question and choices given.

² Includes reports received from Maryland, Virginia, West Virginia and Delaware.

³ A few checked more than one, indicating equal emphasis on several of the alternate choices.

prices at levels announced in advance and adjusted from time to time to reflect gradual economic changes, or a plan for supporting farm income in depressions without attention to individual commodities. Only about one fifth of the economists thought the government should withdraw completely on price or income supports.

In answering the question "On what method of price or income support would you place the greatest emphasis," it will be noticed from the following table that only 8 percent voted to place major emphasis on a government program to purchase surpluses to keep up farm prices. Over two thirds favored either food consumption programs, such as the food stamp plan, or direct payments to farmers to make up the difference between the announced support levels and the market prices as methods of support in farm prices or income.

Classification of the replies by areas and occupations disclosed some rather distinct differences in viewpoints. These are shown in the accompanying table. Economists in the government employment appear somewhat more favorable for government support prices than the other groups, and for government action in general. They are also more inclined to favor subsidized consumption programs.

It is to be understood that this poll represents the views of the individual members of the Association and is not an expression of either the policy of the Association or the views of the Committee on Parity Concepts.

REVIEWS

Food or Famine: The Challenge of Erosion. Ward Shepard, New York: The Macmillan Company, 1945. Pp. vi, 225. \$3.00.

Two recent publications by Ward Shepard indicate quite conclusively that he is willing and able to crusade for what he likes.

In an article entitled "Science and Democracy," published in *Science*, Mr. Shepard, a well-known forester, revealed his friendship for the social sciences. There, in their own house-organ, he carried the fight to those "natural scientists" who were doing their utmost to bar the social sciences from the proposed national research programs.

In *Food or Famine*, Mr. Shepard shows that he is a friend of the land—and a crusader for it. He paints the need for a "world revolution in agriculture," if man is to "conquer soil erosion before soil erosion destroys civilization," and presents a plan for solving this "soil crisis." He uses a broad brush, and his colors are vivid.

Curiously enough, the very crusading spirit that Mr. Shepard has used to promote social science research will also undoubtedly dissuade rural social scientists from giving due consideration to his discussion of conservation problems. Agricultural economists will find it too easy to mark this book with notations of over-drawn predictions, exaggerated claims, and premature conclusions. But does this mean that *Food or Famine* should be classed among the many conservation propaganda tracts that may be good for the lay public but need not attract the attention of professional agricultural workers? After all, a motley herd of political and economic camels have recently been crowding under the soil conservation tent, and the social scientist who has seen some of them may not care to look at another.

But agricultural economists should pay some attention to what Mr. Shepard is leading. He may lose some perspective in describing its parts, but the fact remains that Mr. Shepard's camel has form. There are two main parts: the farm plan and the conservation district. To date, these have carried the brand of S.C.S., an organization to which Mr. Shepard refers in terms that one might expect to come only from its own administrators. But the important point is that whereas it is common to find enthusiastic popular works on the conservation ideal, Mr. Shepard is writing about two very real existing mechanisms in agricultural programming.

When Mr. Shepard refers to the farm management plan as the "only means to protect the general public interest in natural resources," his whole case may serve to be discounted. When he refers to soil conservation districts as "clear proof that the people are prepared to accept both the responsibility of democratic co-operative planning and the self-discipline of enforcing social standards of workmanship and production," one is inclined to reply, "Nonsense."

Regardless of just what their existence proves, however, the fact is that the farm plan and the conservation district are not mere abstractions. While there may be debate as to what place these instruments should have in our agriculture, their numbers are growing; and while some may wonder how conservation work is to be unified, Mr. Shepard is not without an answer. He says in italics that "agricultural extension, instead of being an independent and competing agency, should be merged into the land management district as its educational arm," and the farm plan should become "the modern streamlined substitute for the fragmentary propagandistic methods of 'extension' education."

A good many readers will feel that Mr. Shepard's design is inverted, or that his claims for the farm plan and the conservation district are as dubious as some of his statements about the "infinite value" of land or the need for a "denser rural population." But the issues and the mechanisms he deals with are real and growing; they cannot be disregarded. If, as the saying goes, "You can't beat something with nothing," those who have no alternative proposals ought at least to familiarize themselves with those which Mr. Shepard so positively describes.

LEONARD A. SALTER, JR.

University of Wisconsin

The Wages of Farm and Factory Laborers 1914-1944, Daniel J. Ahearn, Jr. New York: Columbia University Press, 1945. Pp. 245, \$3.00.

Dr. Ahearn has attempted in this volume to explain one of the most striking differences in economic behavior over the past 30 years. Between 1914 and 1939, he points out, wage rates of unskilled factory laborers increased 200 percent while the wage rates of farm laborers hired by the day without board increased only 9 percent. Since in many—probably most—cases persons capable of doing one

type of work can do the other type, farm and factory laborers are potentially competitors for the same jobs. How, then, could such a sharp difference in wages (and incomes) come about and persist over such a long period? To explain this, Dr. Ahearn has collected a great amount of interesting statistical information, analyzed it very closely, and presented it in remarkably lucid form. His book will be a useful reference volume for those working on problems affecting farm laborers and other low income groups in our economy.

For most agricultural economists the most interesting conclusion reached by Dr. Ahearn is his thesis that in general the most important influence on the course of farm wage rates during the period he studied was the movement of farm prices, and that wages generally lag somewhat behind (usually by one year) the up and down movements of farm prices. This conclusion is supported by comparison of the appropriate indices of price and wage movements. Dr. Ahearn grants that the competitive pressure of non-farm employment and wages and productivity considerations also affect the course of farm wages, but he feels that these are secondary factors compared to price movements. His final conclusion on the differential behavior of the two types of wages is phrased in this fashion: "The wage rates of factory laborers rose more than did farm wage rates because manufacturing, unlike agriculture, encountered through many years of this period an expanding market and at the same time managed to raise its efficiency many times over. . . . It (manufacturing) increased its productivity per workers and in so doing was enabled to increase the wage rates of all its workers, skilled and unskilled" (p. 218).

Despite the considerable amount of industry and intelligence that obviously went into the preparation of this volume, however, this reviewer must confess himself somewhat disappointed by the results. The thesis that farm prices largely determine farm wages is never satisfactorily supported by any general theoretical argument, but rather seems to be a *post hoc, ergo propter hoc* type of reasoning. One wonders what Dr. Ahearn would have concluded if he had compared indices of net or gross farm income with farm wages. There is little discussion of the heterogeneity of the farm labor force and of the variety of labor markets in which its wages are determined. Casual workers receiving piece rates are an important segment of the farm labor force, but although Dr. Ahearn presumably includes them in his employment figures he makes little

reference to the fact that the farm wage data he employed do not adequately reflect the changing fortunes of these workers. There is almost no mention of the partial insulation of urban labor markets—arising from racial prejudice, union restrictions, obstacles to geographic mobility of labor, etc.—which seriously reduced effective competition between farm laborers and unskilled factory laborers during the years he studied. In short, he frequently presents an overly simplified picture of the real situation, and as a result his analysis often seems inadequate to explain the important problem he is considering. There are hints on various pages that the author sensed this. (See, for example, pp. 138–139.)

Nevertheless, Dr. Ahearn has made a very interesting contribution to the study of comparative wage changes in different industries. It is to be hoped that he or others will follow up this question, particularly since the wage data on agricultural labor have been so tremendously enriched recently by the BAE group working about Louis J. Ducoff.

HARRY SCHWARTZ

Silver Spring, Md.

Seasonal Farm Labor in the United States, Harry Schwartz. New York: Columbia University Press, 1945. Pp. xii, 172. \$2.25.

The descriptive material in this book is limited to seasonal workers in fruits and vegetables and in sugar beets. The analytical material, however, reveals a broad grasp of the entire agricultural labor problem. The various types of workers and situations are described as well as published information and in some cases personal observations permit. The author covers wage rates, the short employment cycles, casual hiring practices, and living conditions with commendable detail and objectivity.

While the field covered is clearly defined, it is very heterogeneous with its many crops, varied cultural conditions, and differences in organizations and people. The author points out, for instance, that twenty-two different wage structures have been found in the sugar beet deal alone. Among these wage systems he criticizes the sliding scale as causing important alterations in earnings and thus forcing the laborer to bear part of the crop risk. This conclusion holds where the scale varies directly with variations in yield (as in the example on page 125) but not where the scale varies inversely with the yield (illustrated on page 157). I believe that

the inverse scale is designed to stabilize earnings and as such represents an important improvement in the wage system. Such matters illustrate our need for many more detailed and purely objective field studies, something quite beyond what the author intended to check on in this analytical study.

The book covers the situation under both war and peace and the great contrast they afford in the treatment received by labor. After discussing the war time developments, the author concludes that, "The partial organization of farm labor migration during the Second World War has obvious implications for efforts to improve conditions of farm work—both for farmers needing seasonal labor and for those seeking such work." Only through such decasualization does the author see any prospect of material improvement in the conditions of seasonal farm laborers. The prospect of any such action, however, he does not regard as favorable, whether by farmer action, unionization, or governmental intervention.

The author's chief effort is an analytical treatment of the economic problems involved and this must be regarded as a contribution. He first recognizes the peculiar situation of agricultural labor which in peace time is always in over abundant supply in spite of earnings and living conditions in great and growing contrast to those of urban workers. The cause he finds to be that "... large groups have no significant freedom of choice." The absence of choice is laid to lack of industrial skill and training, union restrictions, group discrimination, cyclical unemployment, relative birth rates and mechanization. This placing of much of the burden at the door of urban practices is sound but a major part of these faults are only examples of a much too common philosophy of restrictionism which might have been given greater emphasis. To explain the demand for labor the author describes in some detail how costs operate and how the farmer naturally acts to maximize his own return.

Against this analytical background the author surveys the efforts of farmers to control the labor market and concludes that by such means they were "frequently" able to better their bargaining position both to prevent unionism and to keep wage rates at a low level. He explains a number of outstanding practices and emphasizes the part that has been played by government. There is little doubt about what the farmers wanted to do but unfortunately we have no statistical data with which to check the effectiveness of such control.

This book must be regarded as a material step forward in our analysis of the agricultural labor problem. The author reveals an understanding of all the groups concerned and has developed a discussion which is systematic and objective and which recognizes economic realities.

ROY J. SMITH

University of California at Los Angeles

International Trade and Domestic Employment, Calvin B. Hoover.
New York: McGraw-Hill Book Company, 1945. Pp. xii, 177.
\$1.75.

This volume is one of a series of studies, which are being made for the Committee for Economic Development, dealing with problems involved in the maintenance of high levels of employment in the postwar period. It is concerned with the relationship between international trade and domestic employment.

Dr. Hoover calls attention to the view, long held by economists, that the benefits from international trade are much the same as the benefits from domestic trade. Just as interregional specialization and trade lift living standards among the people of the 48 states, so do international specialization and trade lift living standards among nations.

In his study of the rise and fall of international trade, the author finds that imports are large during periods of prosperity and small during periods of depression. "Thus, curiously enough, the main order of causation between foreign trade and domestic employment in this country is contrary to that claimed both by the advocates of tariff protection and by uncritical enthusiasts of foreign-trade expansion" (pp. 13-14).

The obvious advantages of expanding world trade lead to a study of the forces which tend to restrict it. Prior to the First World War, most of the restraints upon international trade were in the nature of tariffs which grew out of the activities of special interest groups. But during the inter-war period, and especially during the great depression, many other restraints were initiated by governments for the purpose of protecting their internal economies including domestic employment. Dr. Hoover doubts that governments acting independently are likely to throw national controls of foreign trade over-board. But, if prospects of enduring peace are reasonably bright, he believes they will be inclined to support international

institutions for regulating world trade. Such a program will require not only the cooperation but the aggressive leadership of this country. "The United States is exceedingly fortunate in having an economic position so strong that it can afford to take leadership in the movement toward freer international trade" (p. 16).

Dr. Hoover believes that this leadership should be expressed through the following seven point program:

1. Participation in an international plan aimed at the stabilization of currencies.

2. Participation in the organization and operation of an international bank to provide credit for reconstruction and development.

3. Securing the elimination of international cartels, insofar as this is possible; otherwise national and international regulation.

4. Lowering tariff barriers by means of reciprocal trade agreements with other countries.

5. Settlement of lend-lease accounts in such a way as not to "disrupt the general structure of the international balance of payments."

6. Adoption of a mercantile marine policy which gives due consideration to national security, to comparative costs of shipping services, and problems relating to international balance of payments.

7. Adoption of policies that will insure a high level of domestic employment, and collaboration with other countries with a view to maintaining similar high employment abroad.

The author considers the last to be the most important of his seven point program. The maintenance of a high level of employment in the United States is fundamental to high employment abroad and high employment at home and abroad is essential to the adoption of measures for expanding international trade.

In the closing chapter on "Prospective Trends in Our Foreign Trade" Dr. Hoover concludes that "One of the trends most likely to continue is the increasing proportion of manufactured products as compared to agricultural products in our total exports" (p. 136). This conclusion is based largely upon the expectation of continued comparative advantage in the production of capital goods and many consumer commodities such as automobiles, electric refrigerators, motion pictures, etc., but it also is based in part upon the expectation that under conditions of reasonably full employment

"our agricultural exports will continue their declining trend" (p. 139). He believes that "under conditions of substantially full employment and a national income of \$140 billion our wheat production would not, over good and bad crop years, greatly exceed domestic consumption, unless the price to the farmer is maintained at uneconomically high levels. Average annual production would hardly run much in excess of 800 million bushels per year" (p. 136). Under similar assumptions, he concludes that little meat would be available for export, and that the gap between cotton production and domestic consumption would narrow greatly, providing cotton is able to meet the competition of synthetic fibers.

This reviewer is in full accord with the view that our agricultural products are likely to constitute a declining proportion of our total exports in the postwar period. However, he is not as confident as the author appears to be that the agricultural surplus problem will largely disappear even under conditions of reasonably full employment and a \$140 billion national income. Output of cotton, wheat, tobacco, pork and lard, and certain fruits during the war when farmers generally complained of shortages of farm labor, machinery, fertilizers, etc., suggest the need for export outlets for some time to come. A return to grass is the only alternative to wheat in large areas of the Great Plains; alternative uses are not yet in sight for much of the labor and land in the Cotton Belt; and America's capacity to produce hogs has been increased about 20 per cent since the great depression due to the introduction of hybrid corn, the decline in number of horses and mules, and the adoption of improved hog production practices.

The author of this book has done an excellent job of explaining in non-technical terms the complex relationships between international trade and domestic employment. It deserves wide circulation among professional economists as well as among laymen.

AUSTIN A. DOWELL

University of Minnesota

The World's Hunger. Frank A. Pearson and Floyd A. Harper. Ithaca: Cornell University Press, 1945. Pp. 90. \$1.50.

The basic food problem during the recent war was how to reconcile the huge domestic demand for the better types of food with our large commitments for supplying our armed forces and allies. Most of our wartime arguments about food turned on this question.

Pearson in his book, "Food," written in 1944 with Paarlberg pointed out that the real difficulty was simply our inability to produce the food needed to meet all these demands and commitments. They pointed out that the allocation problem was complicated by our ceiling prices. The basic problem has continued into the post-war period. The demands of American consumers for a high quality diet conflict with our commitments for relief feeding in Europe and elsewhere. The basic problem is still a limited available supply.

In the present book Pearson and Harper tell why the world's population cannot have a diet approaching the American standard. The basic reason is lack of supply and of land on which to produce the needed amounts of food. In a series of tables the facts are portrayed on a global basis with continents as the unit of measure. An extended bibliography is included but no specific references and footnotes to sources. This reviewer has neither the basic data, the time, nor the inclination to check the accuracy of these estimates. There is probably a considerable margin of error in them but very likely they portray a generally true picture.

Their basic conclusion is that food production is limited by the areas on which seven key factors are all favorable to crop production. Their factors are adequate sunlight and carbon dioxide, favorable temperature and topography, reliable rainfall, fertile soil and adequate rainfall. They conclude that 7 percent of the earth's land surface is adapted to crop production. This compares with 4 percent now in crops other than hay. "The amount of land that man has overlooked is small." By continents 37 percent of Europe's surface is adapted to agricultural production. Comparable figures are 10 percent for North America, 6 percent for Asia, 5 percent for South America, and 3 percent for Africa and Oceania. Production may be increased some by more complete use of human excreta, now little used outside of densely populated areas in Asia, by better use of animal manures, by more extended use of commercial fertilizers, by mechanization, but not much where population is most dense because of cheapness of human labor, by new and improved varieties of crops and by livestock improvements. Among these they rate the possibilities as greatest from use of fertilizers and new and improved crops. But such developments come slowly and may be offset by other factors operating to pull down production. Trends of the last century suggest to this reviewer that when economic conditions warrant, technical know-how and adequate capital make

possible increases in output per acre on much land. This does not differ from the authors' conclusion that most of the future increase in food supplies will come from applying better methods to existing lands rather than by bringing more land into cultivation.

Perhaps the most surprising of their tabulations is that which indicates the per capita consumption of food (dry matter) by continents. Between the highest and lowest the range is only 10 percent. Europe has the highest average with 587 pounds (dry matter) per capita, Asia, the lowest with 543 pounds. The figure for North America is 567. No attempt is made to compare the quality of diet except by the percentage from animal food. They estimate that 3 percent of the food (dry matter) used in Asia is of animal origin compared to 36 percent in Oceania, 25 percent in North America and 17 percent in Europe. When incomes permit, people try to have animal products make up 40 percent or more of their diet compared to a global average of about 10 percent at the present time. Thus the world would like to consume four or five times more animal foodstuff than at present, but limits on land tie the bulk of the world's population to a plant food diet. Of animal products meats and dairy products are of about equal importance with fish and eggs of minor importance. Fish output is limited by the small proportion of the ocean with adequate plant life to support a heavy population of fish.

They present estimates of the world's population under three dietary standards with existing grain supplies. Under the Asiatic standard the world's population would be increased from 2,170 million to 2,831 million, under the European standard it would be reduced to 2,127 million and under the North American standard to 902 million. The population in millions for North America under these three standards would be 577, 434 and 184, respectively.

They point out that Europe fed itself during the blockade by shifting from a diet including considerable animal products to one including more plant products. Only in food-deficit pockets did widespread starvation and malnutrition occur. The wealth of European agriculture with 37 percent of her land adapted to agricultural production permit her "the luxury of starting struggles like World War I or II. Europe is the danger spot." With a growing population and a high standard of living, wars developed when the surplus population of European countries could not move to other parts of the world and she met difficulty in exporting increasing

amounts of industrial products because of increased manufacturing in other parts of the world. Under these conditions "stronger groups of men will seize, or attempt to seize, fertile valleys, plains, countries from their weaker neighbors." Thus the authors explain the struggle for Northern France, The Danubian valleys and the Ukraine in the last two world wars and by implication in the next one.

Without passing judgment on the accuracy of their basic data, the picture painted is probably in general correct: A huge population occupying a world with vast but limited resources and an unequal distribution of population in terms of these resources. The authors do not say what we should do about all this. They indicate correctly that upgrading of world diets must come slowly and in view of population trends will be of a meager extent. To me the best possibilities for amelioration from the agricultural standpoint is the intensification of research and education regarding the techniques of how to increase output from existing acreages particularly in areas with small peasant farms and limited capital resources. In some places greater applications of capital for land improvement would be productive. If the United States has the "know how," or the means for discovering the "know how," or for financing its discovery in less favored areas, assistance along these lines would be more valuable than, except in emergency situations like the present, attempting to supply food from our own limited production. In this process the soils and crops people will likely have more to contribute than the livestock people. The economists can contribute a critical analysis of what is practicable in view of resources, costs, labor supplies, etc., and should also have much to say about ways and means of making needed capital available.

L. J. NORTON

University of Illinois

How Much Tariff Protection for Farm Products, Murray R. Benedict. Berkeley and Los Angeles: University of California Press, 1945. Pp. 37.

Argentina's Agricultural Exports During World War II, Pavel P. Egoroff. Stanford University, California: Stanford University Press. Food Research Institute, November 1945. Pp. 52. 50 cents.

This is the first pamphlet in a series prepared under the editorship of Professor J. B. Condliffe of the University of California

and under the auspices of the Carnegie Endowment for International Peace. The purposes of the series of pamphlets are stated as follows by Professor Condliffe: "It is the purpose of this pamphlet, and of others in this series, to provide a brief, nontechnical explanation of the relationships that may be helpful to farmers and others in deciding what kind of a tariff and foreign trade program they want to support as being in their own interest and in keeping with the best interests of the United States as a whole."

In this pamphlet, which is introductory to the series, Professor Benedict deals with the nature of foreign trade, the effects of tariffs and the arguments for and against them. The treatment of these topics is nontechnical and realistic. Topics discussed include the relation of high and low tariffs to farm prosperity, the relation of tariffs to farm prices, the effects of specific tariffs on farmers producing the products covered by those tariffs, the difference between a moderate tariff policy and free trade, competition with countries with low and high standards of living for their workers, the position of farmers producing products that supply both domestic and foreign markets, and the need for a positive program on foreign trade. It is pointed out that a prosperous agriculture in the years ahead is dependent upon a good level of employment and high earnings for American workers, export outlets for the major surplus farm commodities at least until orderly readjustments can be effected, and an adjustment of the agricultural plant and working force of the United States to the size that will supply domestic needs plus such exports as can be made effectively on the basis of efficient production. To accomplish the objective of a foreign trade that will aid in promoting a prosperous agriculture in the United States, there must be purchasing power on the part of both buyers and sellers in international markets. One of the chief problems of the post-war period will be the obtaining of dollars by would-be foreign buyers of American farm products. These dollars may be obtained through the sale of foreign goods and services to this country, and long-term capital loans. Stable monetary relations are essential to active international trade. It is pointed out that the importation of a part of the supply of a product into the United States has not resulted in the elimination of the production of that commodity in the United States. It may result in adjustments but a dynamic economy is constantly making adjustments and it is to be expected that the American economy will continue

to be dynamic. The past tariffs of the United States, on the whole, have worked to the disadvantage of American farmers. Trade between nations is one of the factors contributing to world peace and stability.

The pamphlet concludes with a ten-point statement of a farm policy relating to foreign trade. Appendices giving the position of the National Grange on foreign trade policy and of the American Farm Bureau Federation on international trade are included. This pamphlet could well be studied carefully by every technical worker with farm people and by the rank and file of farm leaders.

This is pamphlet No. 8 in the War-Peace series of the Food Research Institute. With a brief statement of the position of Argentina in world markets in prewar years as a background, the shifts forced by World War II are described. Lack of shipping space seriously curtailed Argentina's exports during much of the war period. Exports of corn and wheat gave way to the more valuable and more concentrated animal products such as meat, poultry and eggs.

Corn exports declined from an average of 6.1 million tons in 1935-39 to one-half a million tons in 1944. Supplies of corn available for domestic use in 1944 were nearly five times the normal requirements. During the war years corn acreage was reduced, much corn was used for fuel, consumption of corn as human food was increased slightly, hog production increased materially, and prices were supported by government programs, including the purchase of corn at fixed prices.

Wheat production was maintained fairly well during the war years. Wheat exports did not decline to nearly the degree that corn exports declined, varying from two-thirds to four-fifths as much as in prewar years. Government controls, including government purchases, were used to deal with the wheat situation. The corn program was costly to the government but the wheat program did not prove nearly so costly.

The production of oilseeds was stimulated by the war. Linseed production declined but this decline was more than made up by increased production of sunflower seed and peanuts. Sunflower seed and sunflower oil were exported in larger quantities than in prewar years. The surplus of linseed was disposed of in part by using it as fuel.

Exports of beef declined during the war years. Canned meat exports were larger than in prewar years but exports of chilled and

frozen meat were less. The boning of beef prior to export made possible somewhat larger shipments. Increased prices for meats resulted in larger values for meat exports than during the prewar period of 1935-39. The drought of 1943 curtailed the production of beef and of all crops in that year and helped to prevent the accumulation of surpluses.

Hog production was increased materially during the war. Exports and domestic consumption of pork both increased materially. Mutton production also was increased and larger quantities of mutton were exported.

At the close of the war, Argentina appeared to be in a favorable agricultural position. The author concludes as follows: "In any case the international financial position of Argentina was so markedly improved during the war that smaller exports will suffice to meet her foreign financial obligations and to pay for needed imports."

The reader who wishes an excellent account of the impact of World War II on the agriculture of Argentina will find this pamphlet unusually helpful.

W. E. GRIMES

Kansas State College

Seaman A. Knapp, Schoolmaster of American Agriculture, Joseph Cannon Bailey. New York: Columbia University Press, 1945. Pp. xiii, 307. \$3.25.

This interesting book is another in the series of Columbia University Studies in the History of American Agriculture.

It is a story of the life and activities of Knapp from the time of his birth in 1833 at Schroon Lake, New York, until his death in 1911. The theme of the book is the contribution which Knapp made to the development of agricultural extension work. The most important of these contributions were (1) the emphasis laid on the active participation of farm people in demonstrations conducted for their benefit, and (2) the establishment of the county agent system.

After an early and successful experience in normal school teaching and administration Knapp moved to Iowa in 1866 and purchased a farm.

Before he was made President of Iowa State Agricultural College in 1879, Knapp had been a minister, superintendent of the Iowa Institution for the Education of the Blind, banker, farm journal editor and producer of pure-bred hogs. While at Iowa State

he was instrumental in securing the passage of the Hatch Experiment Station Act.

In 1887 Knapp submitted his resignation to Iowa State College and moved to Louisiana where he became associated with a land settlement and rice growing venture. In 1902 he was appointed Special Agent of the U. S. Department of Agriculture for the Promotion of Agriculture in the South. Some time after that date he had perfected his demonstration technique, first, in connection with the introduction of improved varieties of rice and later in combating the cotton boll weevil. Financial support from the General Education Board, which supplemented Federal and private funds, made possible a widespread adoption of the demonstration technique in the South.

The book gives an interesting account of the conflicting thought within the Department of Agriculture and among the State Agricultural Colleges as to the best methods of doing agricultural extension work. Knapp was a firm believer in the merits of having the farmer conduct demonstrations on his own farm or in his own home. Knapp died in 1911, three years before the passage of the Smith-Lever Act which provided for the Extension of the county agent system through the cooperation of the Federal Government and the State Agricultural Colleges. But it was largely the work which he had done which assured its passage through Congress.

Knapp is depicted as a great leader, who inspired his workers and the cooperating farmer with a sense of the missionary character of their undertaking. Combined with this was a high degree of political skill and generalship.

The author has performed a commendable task in making this contribution to the history of the evolution of the Agricultural Extension Service.

J. I. FALCONER

Ohio State University

Economic Stability in the Post-War World: The Conditions of Prosperity after the Transition from War to Peace, Part II of a Report of the Delegation on Economic Depressions, League of Nations. New York: Columbia University Press, 1945. Pp. 319, \$2.50 paper.

In the midst of the current flood of talk and published material dealing with conditions of world and national prosperity it is re-

freshing and sobering to have offered to us this excellent report by a distinguished group of students and scholars. With so many schemes, ideas, remedies, theories, nostrums and panaceas current, each having more or less of a following, and each possessing a seeming credibility for the uninformed and uncritical, this treatise deserves wide reading and use by all those persons who feel it their duty to think and talk and write about world and national economic problems and who presume in any way to offer contributions to the solution of such problems.

The volume here reviewed, as suggested by the sub-title, deals only with economic problems after the period of transition from war to peace. The problems of the transition period were covered in Part I of the Report, previously published. Following a brief introduction sketching the nature of the problem, stressing its international aspects, and suggesting general objectives of policy, the work is divided into two sections. The first six chapters constituting Section I, "The Nature of Depressions," describe types of depressions, characterize the structural factors, delineate the mechanisms of cyclical fluctuations, deal with the importance of the role of investment, examine the peculiar aspects of depressions in their impact on primary production, and emphasize the international character of booms and depressions. The writer finds this section an exceptionally lucid and well-rounded summary of the content of existing knowledge of this aspect of the problem of economic fluctuations.

The sixteen chapters of the second section examine objectively the many and complicated facets of policy adequate to dealing with depression problems. In these discussions there is no panacea, no monotheistic brief for *the* solution, no one "devil to be cast out." It is a cold and detached evaluation, devoid of doctrinaire approaches, in which the merits and disadvantages of policies covering a wide range are examined. The authors accept as an objective of policy the maintenance of a high and stable level of employment. But they go deeper than most of the current advocates of "full employment" appear to go. "What is required is that resources be employed as productively as possible. There is no sense in merely digging holes in the ground to prevent unemployment." . . . "We must aim at the maximum output of goods and services, and therefore the promotion of technical progress and efficiency must be a central part of policy" (page 117).

Having given this central framework for employment policy, the authors proceed through several chapters to deal in detail with measures for regulating the components and distribution of national expenditure so that they add up to the total of what they call "gross capacity output." Seven chapters are devoted to policy problems inherent in the relationship of expenditures to the level of business activity and employment. One chapter each discusses in turn the constituents of national expenditure; the regulation of total expenditure; the role of private consumption spending, and of private "capital,"—or investment, expenditure; the place of credit policy in stabilizing expenditure; the problems of fiscal policy as related to public expenditure; and the relation of international investment to expenditure variations.

Three chapters on employment and unemployment cover problems in special areas and industries, outline measures for dealing with unemployment arising from chronic depression, and analyse the dangers of inflation in employment policies. The latter chapter is urgently commended by this writer to all those people in this country who are likely to have any influence on policy and programs to handle the current economic crisis in this country.

Those in agricultural fields will find particularly interesting two chapters dealing with national and international measures against depression in raw material and food producing countries. Pointing out the unique vulnerability of such countries and the severity of depressions in them, the authors examine several devices for alleviating distress by national action in these countries, but conclude that autonomous action is limited in its effectiveness and that only concerted international action offers a satisfactory solution. At the international level they advocate the use of buffer stocks, the buying and selling of which would be employed to stabilize producers' prices subject to short-term cyclical fluctuations. When the trend of prices is downward (and not a cyclical movement) the authors believe that international production controls may have some merit but confine their recommendations to an insistence that the success of such programs should be judged on the basis of whether or not they replace high-cost by low-cost producers.

The authors have given us in this excellent book an exceptionally clear-headed and lucidly written challenge to citizenship and statesmanship. It is not controversial. It is devoid of special pleading.

It is remarkably free of technical jargon. It takes the intricate web of national and international economic problems and places it at a level that the average intelligent citizen can master. It is this reviewer's hope that the sanity and wisdom packed into this book will find a wide market.

WALTER B. GARVER

Federal Reserve Bank of Chicago

PUBLICATIONS RECEIVED

- Benedict, Murray R., *A Retirement System for Farmers*. Washington: National Planning Association, 1946. Planning Pamphlet No. 49. Pp. 43. \$.25.
- Fitch, Lyle and Taylor, Horace, *Planning for Jobs*. Philadelphia: The Blakiston Company, 1946. Pp. xxii, 463. \$3.75.
- Gates, Paul Wallace, *Frontier Landlords and Pioneer Tenants*. Ithaca: Cornell University Press, 1945. Pp. 64. \$.75.
- Jesness, O. B., *The Dairy Farmer and World Trade*. Berkeley: University of California Press, 1945. Pp. 20.
- Lasswell, Harold D., *World Politics Faces Economics*. New York: McGraw-Hill Book Company, 1945. Pp. x, 108. \$1.25.
- Moore, Wilbert E., *Economic Demography of Eastern and Southern Europe*. New York: Columbia University Press (League of Nations Publication), 1945. Pp. 299. \$3.00.
- Smith, T. Lynn, *Brazil: People and Institutions*. Baton Rouge: Louisiana State University Press, 1946. Pp. xxiv, 843. \$6.50.
- Snow, Thad, *A Farmer Looks at Fiscal Policy*. Washington: National Planning Association, 1945. Planning Pamphlet No. 48. Pp. 22. \$.25.

NEWS NOTES

Nineteen institutions replied to the Editor's request for information regarding current graduate enrollment in agricultural economics. These institutions reported 203 students, of whom 72 were resuming studies interrupted by the war and 131 were new students. Graduate enrollment in agricultural economics in these reporting institutions was slightly over two thirds of that reported in 1939-40. About half of the institutions reported a marked increase in undergraduate enrollment in agricultural economics, while the remainder reported no change from the prewar situation. The reporting institutions had about half of the total graduate enrollment in agricultural economics in 1939-40.

The Western Farm Economics Association will meet in Corvallis, Oregon June 26 to 28 inclusive.

The reorganization of the Bureau of Agricultural Economics announced by Secretary of Agriculture Clinton P. Anderson on December 12, 1945 makes the Bureau the primary agency in the Department of Agriculture for the collection of agricultural statistics, for economic research, and for making available statistical reports and research findings. Being a staff agency of the Secretary, the Bureau also coordinates the statistical work and economic research of the Department as a whole. The following administrative changes are an outcome of the Bureau reorganization:

In order to obtain closer cooperation between the Division of Crop and Livestock Estimates of the Bureau of Agricultural Economics and the Florida Agricultural Experiment Station, Mr. J. C. Townsend, Jr. and Mr. J. B. Owens, Agricultural Statisticians, Orlando, Florida, were on October 12, 1945 appointed as Collaborators on the Staff of the Department of Agricultural Economics, Florida Agricultural Experiment Station. On the same date, Mr. G. Norman Rose was appointed as Associate Agricultural Economist, Department of Agricultural Economics, to be stationed at the Orlando office of the Bureau of Agricultural Economics.

Bushrod W. Allin, Chairman of the new Outlook and Situation Board, USDA, is responsible for the technical review and approval by the Board of all economic outlook and situation reports issued by the Bureau of Agricultural Economics or by other agencies of the Department. The Chairman of the Board is designated by the Chief of the Bureau and the Board consists of specialists drawn from the Bureau, and, where appropriate, from other agencies of the Department. The membership of the Board may vary for different reports or classes of reports. Officers of the Board are:

- (a) Chairman—Bushrod W. Allin, formerly assistant to the Chief;
- (b) Vice-Chairman—J. P. Cavin, Associate Head of the Division of Statistical and Historical Research; and
- (c) Secretary—Robert C. Tetro of the Division of Economic Information and formerly assistant to the head of the Division of Farm Management and Costs, Bureau of Agricultural Economics.

The total membership of the Board for reviewing and approving any single

report consists of at least 3 and not more than 10 persons, including either or both the Chairman or the Vice-Chairman.

Frank M. Atchley returned on April 1, 1946 to his position as Research Assistant in Farm Management at Michigan State College. Mr. Atchley has been on leave of absence for military service since April 1, 1942. Part of his military service was in the Pacific area. At the time of his release he was in field artillery and held the rank of Major.

R. H. Baker, recently returned from military service, has been appointed Instructor in the Department of Rural Economics, Ohio State University.

Ralph L. Baker, returned from the Navy April 1, and has resumed his duties as assistant professor in agricultural economics and in extension research at Iowa State College.

Clare A. Becker on March 1, 1946 was appointed as Extension Specialist in Farm Management at Michigan State College. Dr. Becker was with the U. S. Navy from October 1942 to February 1946 and at the time of his release held the rank of Lieutenant Commander.

Merrill K. Bennett of the Food Research Institute, Stanford University, is serving as a member of the ad hoc Agricultural Economics Committee of the Food and Agriculture Organization of the United Nations.

J. Homer Blackstone has been employed as Assistant Economist by the Alabama Agricultural Experiment Station to conduct a special dairy cost study.

George E. Brandow returned to the Pennsylvania State College January 1 after being released from the Navy in December. Dr. Brandow was on leave for more than three and one-half years, during which he spent one year with the Office of Price Administration and the remaining time in the Navy.

Karl Brandt of the Food Research Institute, Stanford University, expects to return in May from Germany, where he has been serving since early December with the Food and Agriculture Branch, Economics Division, Office of Military Government for Germany (U.S.). Dr. Valdimir Timoshenko joined the same organization as Special Assistant in February.

Harold Breimyer, Agricultural Economist, has returned to the Division of Program Analysis and Development, Bureau of Agricultural Economics, from service as a Lieutenant in the U.S. Navy.

Royal G. Briggs has returned to the University of Missouri as an instructor. Mr. Briggs served as a Lieutenant in the Navy.

Max E. Brunk, Associate Agricultural Economist, Florida Agricultural Experiment Station, is on leave of absence pursuing graduate work at Cornell University under a General Education Board fellowship. Mr. Daniel E. Alleger has been appointed to fill the temporary position vacated by Mr. Brunk.

Mark T. Buchanan, former head of the Division of Agricultural Economics was appointed as director of the Washington Agricultural Experiment Stations and vice-director of the Institute of Agricultural Sciences. He assumed his duties January 1.

Roy J. Burroughs, of the Division of Agricultural Finance, Bureau of Agricultural Economics, is on loan to the National Housing Agency until July 1. He is the economist member of an advisory commission being sent to the Philippines at the request of the Philippine Government and the State Department to assist in formulating plans for the rebuilding of Manila.

W. F. Callander, Assistant Chief, Bureau of Agricultural Economics, and Chairman of the Crop Reporting Board, supervises and directs the state offices of the Bureau and the work of the Division of Agricultural Statistics.

Bradford D. Crossmon, formerly Extension Economist in Farm Management, University of Connecticut, has accepted a position as Farm Management Specialist with the Farm Security Administration, Northeast Region.

George B. Davis, formerly research assistant in the Department of Farm Management, Oregon State College, Corvallis, Oregon, has recently returned to the staff as assistant economist after serving more than three years in the U.S. Marine Corps.

Joseph S. Davis of the Food Research Institute, Stanford University, has recently been appointed to membership on the Board of Directors of the Social Science Research Council, as representative of the American Statistical Association.

Peter H. DeVries, former head of the Division of Economic Information, Bureau of Agricultural Economics, has transferred to the Production and Marketing Administration, as a deputy director of the Information Service. Franklin Thackrey, formerly information specialist in the Division of Economic Information, is now Acting Head of the Division.

Isadore Ehrlichman, Agricultural Economist, has returned from the Armed Forces to the Division of Marketing and Transportation Research, Bureau of Agricultural Economics.

F. F. Elliott, Associate Chief, Bureau of Agricultural Economics, is responsible for coordinating and improving all statistical services and economic research of the Department.

Richard Gabel, Agricultural Economist, who was with the Armed Forces, has returned to the Division of Marketing and Transportation Research, Bureau of Agricultural Economics.

Harold G. Halcrow, Lt. (j.g.) in the United States Navy, has returned to his work as Assistant Professor in the Department of Agricultural Economics and Economics and Sociology at Montana State College.

Harlow W. Halvorson has returned to his position as Instructor in Agricultural Economics at the University of Minnesota. Captain Halvorson served 22 months in the Army Air Corps in the South Pacific.

C. H. Hammar has returned to the University of Missouri and assumed his duties as Professor of Agricultural Economics after serving about two and one-half years overseas as a Lieutenant-Colonel in the Allied Military Government.

William A. Hartman, regional agricultural analyst, has returned from the Army, where he was a Lt. Colonel, to work in the Atlanta office of the Division of Program Analysis and Development, Bureau of Agricultural Economics.

R. C. Headington, recently returned from military service, has been appointed Instructor in the Department of Rural Economics, Ohio State University.

William F. Henry, who has been in the U. S. Navy since February 1943, received his release November 1945 and joined the staff as Assistant Extension Economist in Farm Management at the University of Connecticut. He is replacing B. D. Crossmon who has left to take a position with the Farm Security Administration.

Clifford Hildreth has returned from the Navy and resumed his research and teaching duties as instructor in Agricultural Economics at Iowa State College.

Harold F. Hollands has resumed his position as Professor of Agricultural Economics and Economics and Sociology at Montana State College. Professor Hollands has been on leave with the War Food Administration as Milk Market Agent for the Seattle district.

Donald C. Horton has been relieved of most of his regular duties in the Division of Agricultural Finance, Bureau of Agricultural Economics, to permit him to devote substantially full time to a study of the economic characteristics of agriculture related to its financing. The study is a co-operative project between the Bureau of Agricultural Economics and the National Bureau of Economic Research, and is a part of a larger research program in agricultural finance under the direction of Dr. E. C. Johnson, Financial Research Program, National Bureau of Economic Research.

Roy E. Huffman, Lt. (j.g.) in the U. S. Navy, has returned from military service and accepted the position of Professor in the Department of Agricultural Economics at Montana State College. Before going into the Navy Professor Huffman was an instructor in this Department.

Sherman E. Johnson, Assistant Chief, Bureau of Agricultural Economics, supervises and directs the work of the Division of Agricultural Finance, the Division of Farm Management and Costs, and the Division of Land Economics. The new head of the Division of Farm Management

and Costs is Carl P. Heisig, who has been one of the Division's agricultural economists for some time.

Donald R. Kaldor has returned from the Army and resumed his teaching duties as Assistant Professor in Agricultural Economics at Iowa State College.

Ben T. Lanham, Jr. and J. N. Mahan have returned to their posts as Associate Economists with the Alabama Agricultural Experiment Station after extended military leave.

Harold T. Lingard, who held the rank of Captain in the Quartermaster Corps, has returned to the Division of Agricultural Finance, Bureau of Agricultural Economics, and has taken over the direction of a cooperative research project between the Bureau of Agricultural Economics and the Bureau of the Census to develop bench mark estimates of farm mortgage debt and related series for the census year 1945.

Herschel W. Little, Agricultural Economist, who was on military leave, returned to the Division of Marketing and Transportation Research, Bureau of Agricultural Economics, Mr. Little has been made representative of the Division in the Bureau's Appalachian, Southeastern, and Southwestern regions and will be stationed at Atlanta, Georgia.

Arthur Mauch has resigned his position as Regional Leader of Land Economics, Bureau of Agricultural Economics, Atlanta, Georgia, to become Associate Professor Agricultural Economics at Michigan State College. Dr. Mauch will be an Extension Specialist in Fruit and Vegetable Marketing.

W. W. McPherson, Captain in the Armed Forces, has returned as Bureau of Agricultural Economics Representative in the Department of Agricultural Economics at North Carolina State College of Agriculture. McPherson will devote his time to the problem of reconversion in the post-war period.

Earl E. Miller has transferred to the Agricultural Division of the Bureau of the Census from his former position in the Division of Agricultural Finance, Bureau of Agricultural Economics.

Joe R. Motheral has resumed his work in the Division of Farm and Ranch Economics at the Agricultural and Mechanical College of Texas. He served 16 months with the Navy in the South Pacific.

Wallace Ogg has returned from the Navy and has resumed his duties in Extension Service and research and as assistant professor in Agricultural Economics at Iowa State College.

B. D. Parrish has been advanced from assistant agricultural economist to associate agricultural economist in the Division of Agricultural Economics at Washington State College.

E. A. Perregaux, Head, Department of Agricultural Economics, University of Connecticut, left March 15 for a year's sabbatical leave. He will act as Research Consultant with the American Institute of Cooperation.

W. Henry Pierce, Lt. Col. in the Armed Forces, has accepted a position as Assistant Agricultural Economist in the Department of Agricultural Economics at North Carolina State College.

Benjamin D. Raskopf, Associate Agricultural Economist, University of Tennessee, has returned to his former position after a four year tour of duty with the U. S. Air Corps. While on military leave, he served in both the United States and Europe and attained the rank of Lieutenant Colonel.

Brice C. Ratchford, Captain in the Armed Forces, has returned to duty in Farm Management Extension at North Carolina State College of Agriculture.

Charles E. Robertson, recently released from the U. S. Air Corps, has taken the position of Assistant Agricultural Economist in the Arizona Agricultural Experiment Station.

Forrest E. Scott, Agricultural Economist, who was on military leave, returned to the Division of Marketing and Transportation Research, Bureau of Agricultural Economics. Mr. Scott will be stationed at the Bureau's West Coast Office at Berkeley, California.

Norman L. Smith on February 13, 1946 was appointed as Extension Specialist in Farm Management at Michigan State College. Major Smith served as an officer in the field artillery from January 1942 to December 5, 1945 and was overseas 43 months in the South Pacific.

Ray C. Smith, Assistant Chief, Bureau of Agricultural Economics, supervises and directs the work of the Division of Farm Population and Rural Welfare, The Division of Program Analysis and Development, and the Division of Program Surveys.

Lauren Soth has returned from the Army and has resumed his duties as an Associate Professor and editor of the *Iowa Farm Economist*.

Cecil D. Thomas, Major in the Armed Forces, has returned to duty in Farm Management Extension at North Carolina State College of Agriculture.

M. L. Upchurch, formerly agricultural economist, Bureau of Agricultural Economics, was appointed Associate Professor at Oregon State College January 1 following release from military duty.

Walter C. Verlander returned to his duties as research associate in the Department of Agricultural Economics, Louisiana State University, on February 1, 1946. From April 1942 to December 1945, Captain Verlander

was in the Pacific Area where he commanded a Tank Destroyer Company and participated in three major campaigns.

Harold A. Vogel, head of the Division of Program Analysis and Development, Bureau of Agricultural Economics, has returned from service as a Lieutenant in the U. S. Navy.

O. V. Wells, Assistant Chief, Bureau of Agricultural Economics, supervises and directs the work of the Division of Marketing and Transportation Research and the Division of Statistical and Historical Research.

Richard G. Wheeler has accepted a position as Research Economist at the University of Connecticut and will devote full time to research on tobacco production and marketing problems.

Robert Wilcox has returned from the Army and has resumed his duties as instructor in Agricultural Economics and Extension at Iowa State College.

Martin D. Woodin was recently separated from the Navy and has resumed his duties in research and teaching in the Department of Agricultural Economics, Louisiana State University. Prior to his return he was in command of a group of landing craft in the Western Pacific and China Sea Areas.

H. N. Young has been appointed Director of the Virginia Agricultural Experiment Station.

Wade P. Young, formerly with the Division of Statistical and Historical Research, Bureau of Agricultural Economics, was on January 7 appointed Associate Agricultural Economist, Department of Agricultural Economics, Florida Agricultural Experiment Station.

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Department of Economics, The University of Chicago

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